ECONOMIC GEOGRAPHY

INDUSTRIES AND RESOURCES OF THE COMMERCIAL WORLD

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PREFACE

The subject of economic geography deals with major industries, basic resources, and the leading nations of the world. Its center of interest is the livelihood of mankind, and its sphere of influence is as wide as the Commercial World. Its materials, concepts, and principles are of concern to the average citizen and vitally affect the policies of governments. As an instrument of education, therefore, the study of economic geography can and does render society an important and distinctive service.

The educational objectives which give the study of economic geography a place in the school curriculum are reflected in the plan and organization of this book. The work is divided into seven parts, the first of which is concerned with the world as a whole and the other six with its major regions. Throughout the book the all-important question of livelihood appears again and again, first introduced in terms of occupational groups and subsequently in terms of major industries. As the thought of the book develops, moreover, the natural conditions and resources on which all industry and trade are based are kept constantly in the foreground. To assist the students in gaining a working knowledge of the outstanding nations of the world, each major producing and consuming nation is treated separately. In addition, the international significance of these regions is brought out by the ever-recurring theme of trade and commerce, a theme which, like that of livelihood, runs throughout the book.

As the modern world depends upon modern transportation and as transportation problems are characteristic of most parts of the Commercial World, an analysis of each type of transport—rail, highway, water, and air—is presented in an early chapter. Subsequently, studies of transportation in Eastern and Western United States and in other areas show the interrelation of the several types of transportation in the major commercial regions.

Every student of world affairs admits the importance of maps, especially political and physical maps. In recognition of this fact and of the further fact that many schools cannot furnish atlases to their students, "Economic Geography" features an Atlas Section containing a specially designed series of colored political and physical maps. To acquire ability to read and use these maps will in itself be a valuable achievement for the student.

In its treatment of natural conditions and resources, "Economic Geography" makes a double departure from the past. In the first place, climate, surface features, soils, and other elements of the natural environment are given separate treatment early in the book. In the second place, these basic conditions and resources are treated in a geographic rather than a physiographic manner. By means of maps and text, for example, the distribution of the plains, hills, plateaus, and mountains of the world is brought out.

In similar fashion the distribution of the largest fifteen drainage basins rather than the work of running water is emphasized, and the mineralized areas of the world, areas of enormous significance in world affairs, are mapped for the first time. It is believed that this new method of approach will be welcomed both by teachers of geography and by those interested in the social studies.

"Economic Geography" as a text for American students logically places the United States in the center of thought. By means of a careful study of our leading industries and resources the student gains an understanding of the internal resources and problems of our country, and by surveying our trade with other countries he comes to appreciate the vital problems connected with our international relations.

"Economic Geography," however, does not look at the world simply from the eyes of the United States, but invites the student to take his stand successively in the major foreign countries. The student sees Britain from the British point of view and Germany as the Germans see it. France and the French Empire are presented in terms of French industries and resources. Later, the Soviet Union, with its huge area, great resources, and difficult problems, and Japan and its place in the Commercial World pass under review. Finally the student completes his study of the Commercial World by surveying the industries, resources, and trade of Argentina and the other major lands in the Southern Hemisphere. Under this plan of procedure the student becomes acquainted with people, with the commodities they produce, with national and international problems—in short, with the world as it is today. "Economic Geography," therefore, is believed to be cosmopolitan in its outlook, rigorous in its penetration, discriminating in its material, and pedagogically sound in its organization and text. It is hoped that it constitutes an approach to education in the best American manner.

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For the sections of the book dealing with foreign areas the authors placed dependence on the publications of foreign governments and on the works of American and other specialists. In the case of the Soviet Union, John A. Morrison helped with materials and translations and gave numerous suggestions in regard to the final manuscript. For the Far East the publications of George B. Cressey, Robert B. Hall, and Glenn T. Trewartha proved invaluable. In connection with South American questions the authors profited greatly from the writings and counsel of Robert S. Platt and Preston E. James; and for materials and ideas about Australia the authors found the pioneer work of Griffith Taylor indispensable. Howard K. Morse gave invaluable help in designing the colored plates in the Atlas Section and in planning the layout of the book. Figures 1, 14, 15, 20, and 27 are drawn on Goode's Homolosine Equal Area Projection through the courtesy of Henry M. Leppard and The University of Chicago Press. The authors are deeply indebted to Harry H. Wood for counsel on many matters connected with their work. To Gertrude N. McGinnis, on whose technical skill and expert advice reliance was placed at many points, the authors are deeply indebted. Finally, and perhaps most of all, the authors owe a vote of appreciation to teachers in many sections of the country for suggestions and advice in formulating the plan of the book and in selecting its topics and materials.

ECONOMIC GEOGRAPHY

INDUSTRIES AND RESOURCES
OF THE COMMERCIAL
WORLD

1

THE COMMERCIAL WORLD

CHAPTER I

PEOPLE AND OCCUPATIONS

Where People Live. Imagine a man from the planet Mars landing on the earth. Think of his overwhelming curiosity regarding the new world he has reached. Probably the question uppermost in his mind would be Is the earth inhabited? His immediate answer to that question would depend upon the part of the world in which he landed. Suppose his first impressions were formed at Charing Cross in London or at 42d Street and Broadway in New York. He would realize at once that he was in a land of many people, for each of those corners has been called the busiest spot in all the world. But if he landed in the Sahara or in the tundra of Siberia, the man from Mars might leave or perish without seeing a human being. Even after traveling a long distance, he might think the earth uninhabited.

Such contrasts of population density appear in each continent and to some degree in every country. The two billion (2,000,000,000) inhabitants of the earth are distributed quite unequally (Fig. 1). Some regions are crowded with people, others remain unsettled. Although half the people of the world live in Asia, the northern part of the continent is practically unoccupied. Our own continent also shows strange contrasts in human occupation. Even within the United States some areas have many people, some are moderately peopled, and others have almost no population.

Densely Peopled Areas. From the standpoint of commerce the most striking fact about the distribution of population in the world is that four regions contain most of the people. If the man from Mars had visited (1) Eastern Asia, (2) India, (3) Western Europe, and (4) Eastern United States, he would have seen the major four densely peopled regions of the world (Figs. 1 and 2). Although these regions taken together make up only a tenth of the land surface of the globe, they contain approximately two thirds of the total population. We shall see presently that they are busy areas and produce and consume a notable fraction of the commodities entering commerce.

Moderately Peopled Areas. Large areas in each continent are moderately peopled (Fig. 3). A moderate density of population characterizes much of rural United States and is found also in parts of South America, Africa, and Australia. In Europe and Asia areas of moderate population border the densely peopled regions and also appear in

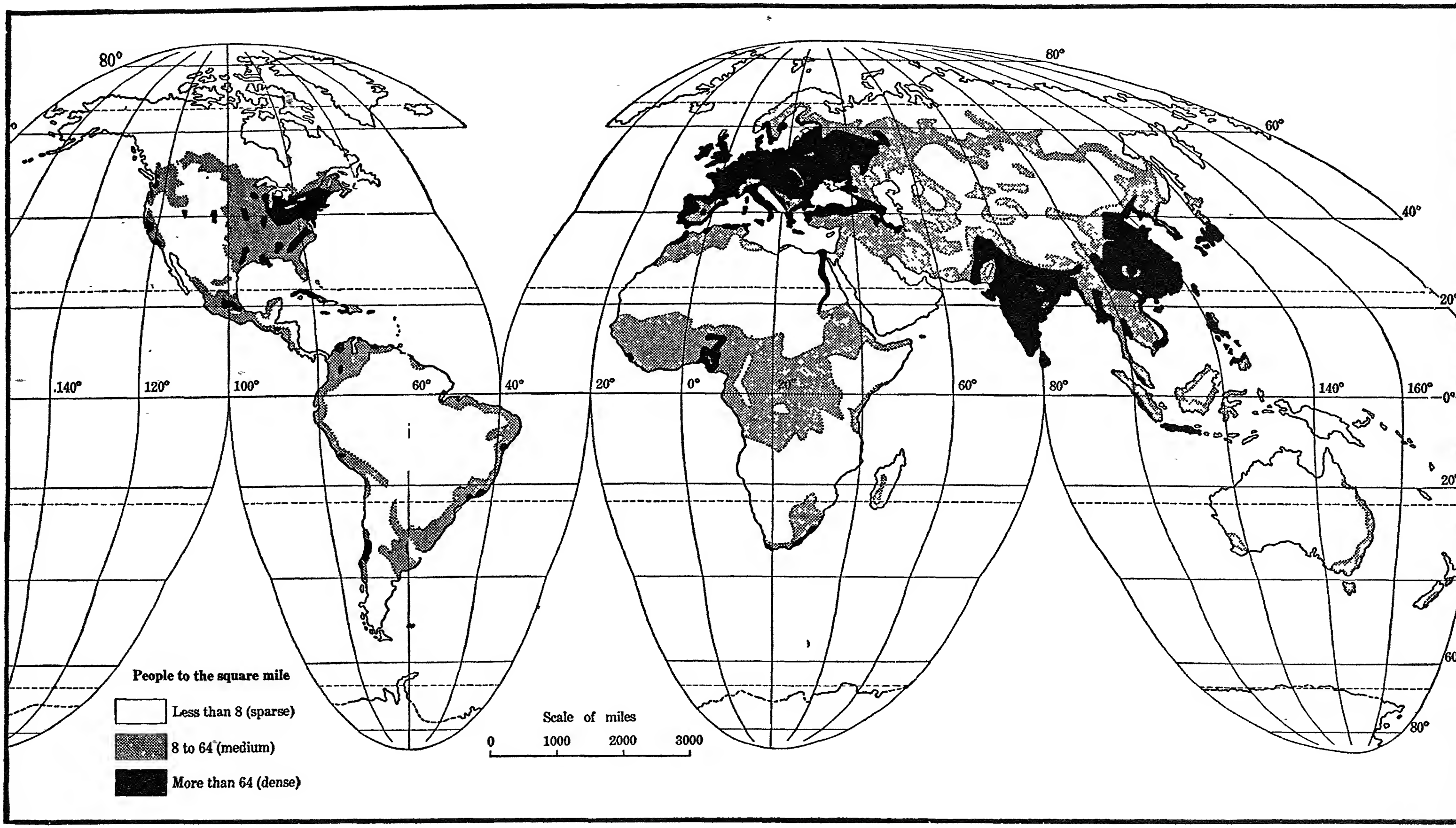


Fig. 1. Distribution of population in the world

Ewing Galloway, N.Y.

FIG. 2. A densely peopled area (New York City)

other parts of the continents. In commerce some of the moderately peopled areas play important roles. They constitute important markets for manufactured goods and contribute large quantities of foods and raw materials to the manufacturing countries.

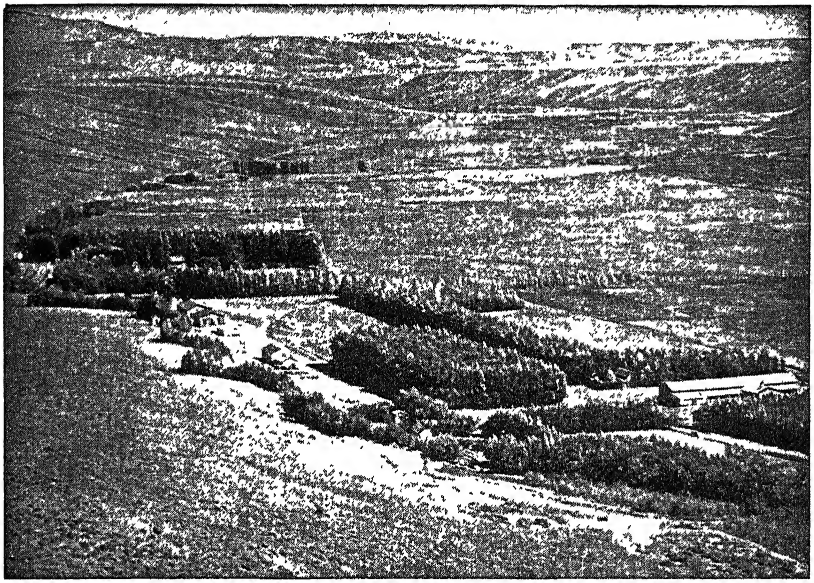
Sparsely Peopled Areas. Approximately half the world is sparsely peopled (Fig. 4). This means that half the world takes only a small part in commerce. With the exception of Europe, all the continents contain large uninhabited or sparsely settled areas (Fig. 1). Within these broad areas, however, there are considerable variations in the number of people and the amount of commerce. In some of them small settled districts interrupt a vast expanse of wilderness. In others the habitations are far apart, and an owner controls an estate with the dimensions of a feudal kingdom. Still other areas, like Antarctica, contain no permanent population and are of little or no use to man.

Leading Countries in Population. Ten countries contain at least four fifths of the people of the world. All lie north of the equator, and all but the United States are in the Old World. Four of the ten—the United Kingdom, France, Germany, and Italy—lie in the densely peopled belt of Europe. All four rank among the influential nations. A fifth, the Soviet Union, lying partly in Europe and partly in Asia, is the world's largest country. On the eastern and southern rim of

FIG. 3. A moderately peopled area (Illinois)

Asia, four countries—China, Japan, India, and the Netherlands Indies—together contain more than a third of the world's people.

Major Consuming Nations. The demand of a country for goods is not simply a matter of the number of consumers living in that country. It also depends on how much is consumed by each person. Although a map of consumers is identical with the population map (Fig. 1), a map of consumption would look quite different. Some countries consume more goods and a greater variety of goods than other countries having the same total population. This means that the average consumption per person (the per-capita consumption) is higher in some countries than in others. China and India, for example, have the largest total populations of the countries of the world, but they do not rank high in per-capita consumption. If one selected a hundred thousand people at random in the United States, for example, and the same number in India, he would find a much higher total consumption of goods in the former group and also a much higher per-capita consumption. The countries of Western Europe are like the United States in this respect. Not only because they contain many people but because these people consume a great amount and variety of goods, the United States and Western Europe are the greatest consuming areas of the world.



Bourquin & Co., Buenos Aires

FIG. 4. A sparsely peopled area (Patagonia)

How We Gain a Living. We gain a living by finding employment in some service or industry or profession. These services, industries, and professions are the occupations of mankind. Each occupation represents a line of human work, and each provides us with one or more of the things essential to our comfort, welfare, and happiness. In producing these things we make large use of the soil, minerals, and other resources of nature. Our occupations, therefore, are the means by which we, the people, gain a living from the earth.

A Classification of Occupations. The occupations by which people gain a living may be classified into the ten groups shown in Figure 5. The first six of these groups directly utilize one or more natural resources and therefore are basic industries. The dependence of manufacturing, transportation, and trade upon natural resources is less direct than that of the basic industries, but the dependence is no less real.

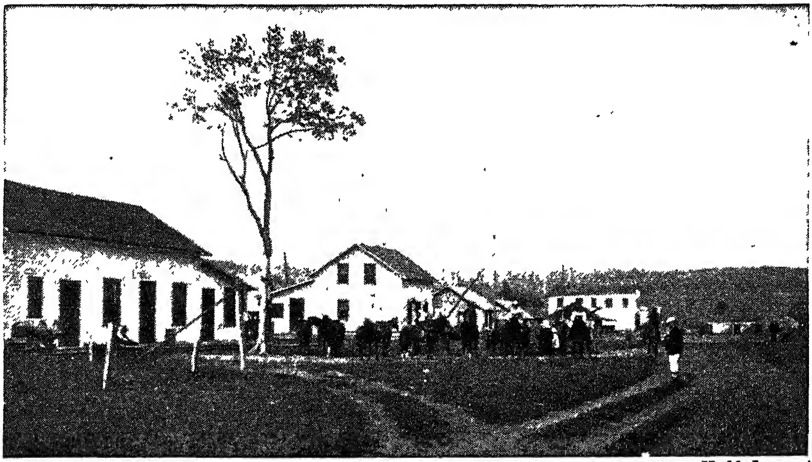
Hunting. Hunting is the most primitive of human occupations. It leads men beyond the settled areas into the remote and unoccupied territories (Fig. 1). In these frontier areas man lives close to nature, and many of the primitive inhabitants derive their livelihood mainly

Occupational Groups	Resource of the Natural Environment Utilized by the Industry	Representative Products of the Industry
1. Hunting[1]	Wild animal life, such as the fox and other fur-bearing animals	Furs, skins
2. Fishing[1]	Animal life of seas, lakes, and rivers	Fresh, dried, smoked, salted, and canned fish; sponges, pearls, whale oil, etc.
3. Mining and quarrying[1]	Veins, seams, or deposits of minerals in rocks, or rocks themselves	Coal, iron, petroleum, copper, lead, zinc, tin, gold, silver, marble, granite, limestone, etc.
4. Lumbering and other forest industries[1] . .	Forests	Lumber, lath, shingles, telephone poles, fence posts, pulpwood, gums, nuts, dyewoods, tanning materials, etc.
5. Grazing[1]	Grassland	Meat, hides, skins, hoofs, wool, etc.
6. Agriculture[1] . . .	Surface + soil + water + climate	Foods, beverages, fibers, hides and skins, oils, etc.
7. Manufacturing . .	Utilizes products of any or all of the basic industries	Food products, textiles and clothing, iron and steel, vehicles
8. Transportation . .	Land, water, air	Movement of goods and people
9. Trade	Furnishes the means by which products are distributed from producer to consumer	
10. Professional, personal, and domestic service	Concerned with the comfort, welfare, education, and entertainment of mankind	

FIG. 5. Occupations by which people gain a living

or wholly from the animal life of the region. In the Arctic plains of North America, for example, the Eskimos depend upon the chase for much of their food, clothing, and shelter. Some native tribes live almost, if not completely, isolated from other men. The demand for furs in the world is so great, however, that in most of these remote areas fur-trading posts are maintained at widely spaced intervals (Fig. 6). The traders at such commercial outposts exchange guns,

[1]Basic industries, that is, industries by which mankind directly utilizes one or more elements of the natural environment.



H. M. Leppard

FIG. 6. Trading post of the Hudson's Bay Company at Fort St. John, British Columbia. The riders are Indians from near-by reservations

ammunition, traps, knives, cloth, and other goods for the furs brought in by the native hunters and trappers.

Fishing. Fishing is one of the most widespread of human occupations. Fish are caught in lakes, rivers, and seas of all inhabited parts of the world. The fishing industry as an organized commercial pursuit, however, is limited to a relatively few areas. Most of the fish of commerce come from salt water and are caught along the shore or on shallow "banks" at only a short distance from the coast. In some waters fish are so plentiful that a regular supply can be caught and shipped to market (Fig. 7). Some of the catch goes to market as fresh fish, but large quantities are salted, dried, smoked, or canned. Fresh fish spoil quickly, and thus they must be sold in near-by cities or, if marketed at a distance, must be shipped alive or iced. As might be expected, the largest and most noted fisheries are along the coasts of the densely peopled regions. Thus, the famous fisheries of the North Sea and the Norwegian coast supply the markets of Western Europe; the Sea of Japan and other coastal waters of Japan and China furnish fish for those populous countries; and the New England, Nova Scotia, and Newfoundland fisheries supply most of the demand in Eastern United States.

Mining and Quarrying. The mining and quarrying industries include four major activities: prospecting for the deposits; organizing

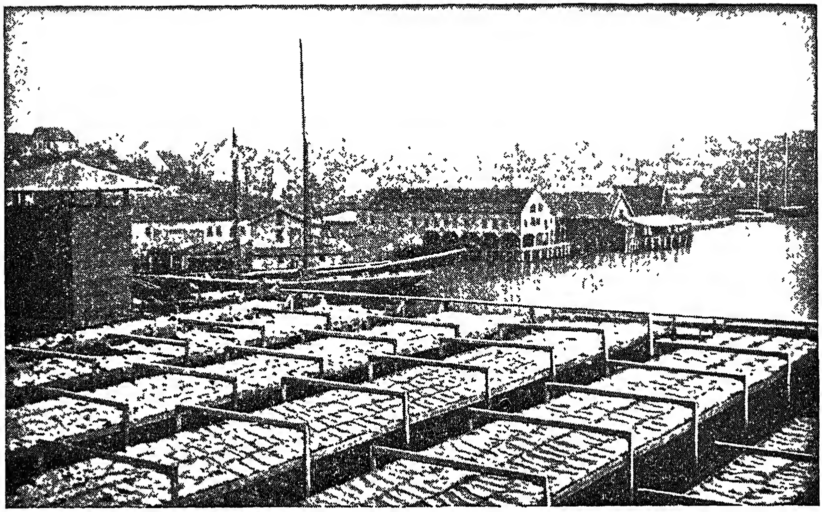


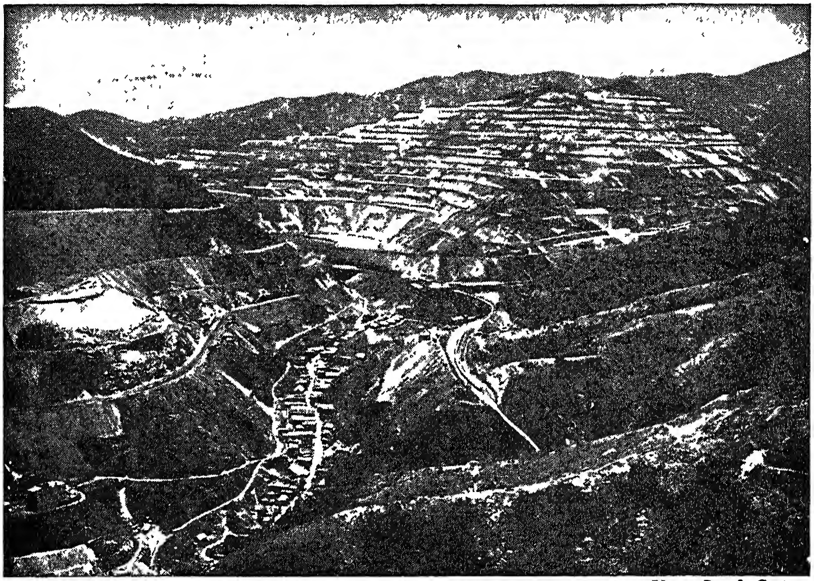
FIG. 7. Utilizing the resources of the sea. Codfish curing in the sun at Gloucester, Massachusetts

the operating company; building and operating the mines (Fig. 8); and in some cases crushing or smelting the products of the mines. Nearly always these major activities raise special transportation problems and in some cases involve building entirely new camps or towns. In all cases the purpose of the operation of the mines is the same; namely, to supply some mineral demanded by industry.

Some mining districts—the coal fields of Great Britain, for example—lie in or near densely peopled areas where there is a great demand for the product. Others occur in deserts where all food and water have to be brought in. Still others, like the tin-mining areas of Bolivia, are in high mountains where transport is difficult, or in Arctic wastes where the miners face long, dark, cold winters. In such areas the mines are the only reason for the presence of people.

Lumbering and Other Forest Industries. Forest industries employ people in many parts of the world. In the United States and in many other countries, forest industries employ only a small part of the population. In a few countries lumbering or some other forest industry is a major occupation. The forest industries of Finland, for example, support more than half the population.

In many areas the forest industries include *logging* (Fig. 9), in which process the trees are felled and the logs hauled or floated to



Union Pacific System

FIG. 8. Utilizing an underground resource. Copper-mining at Bingham, Utah

the mill; *sawing*, in which the logs are sawed into lumber or shingles or other products; and *woodworking*, in which laths, boxes, and many other things are produced at the mill. In some parts of the world the forest industries are of a different sort. In the tropical forest of Brazil, for example, the natives tap rubber trees for latex, and by the same method we get pitch from our Southern pine forest. In Portugal the cork oak is stripped of its bark in order to obtain the cork of commerce. Logs from the Gran Chaco forests of northern Argentina yield an extract useful in tanning hides and skins into leather. Gums, nuts, dyes, and fibers are other forest products.

Grazing Industries and Semiarid and Desert Grasslands. In some parts of the world, grazing livestock on wild grass is the principal occupation of the people (Fig. 10). In general, grazing is practiced in areas without enough rain for crops but with enough rain for grass in some part of the year. In the western part of Asia and in some parts of northern and eastern Africa the owners of the flocks and herds live nomadic or seminomadic lives, following their animals from place to place according to the quality of the grass. In all the semiarid and

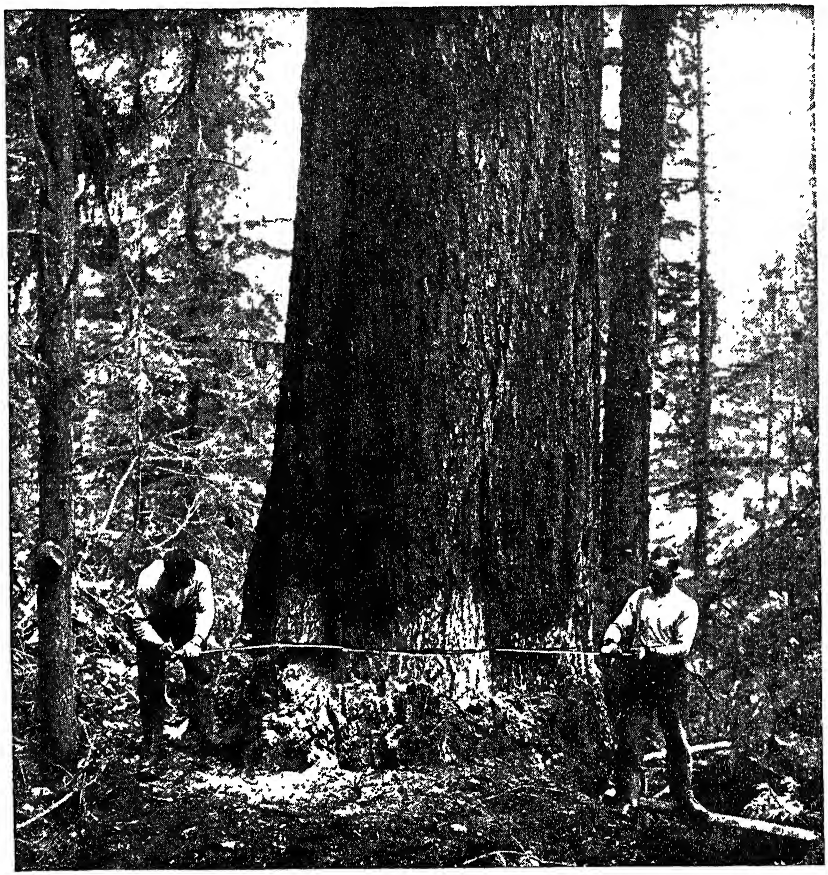


FIG. 9. Utilizing the resources of the forests. Felling a Douglas fir tree in the Pacific Northwest

desert areas the population is sparse or scant, and the contribution of these areas to commerce is relatively small. They are lands of limited opportunity.

Agriculture. In terms of people employed, agriculture is the major occupation in most parts of the world. Our farms furnish us with most of our food and with many other commodities (Fig. 11). In fact, mankind is so dependent upon farm products that the majority of people live in or near farmed areas. Agriculture is of two broad types; subsistence agriculture, in which the farm produces nearly everything the family eats and wears; and commercial agriculture, in which the farmer raises a product for sale. In the latter type the

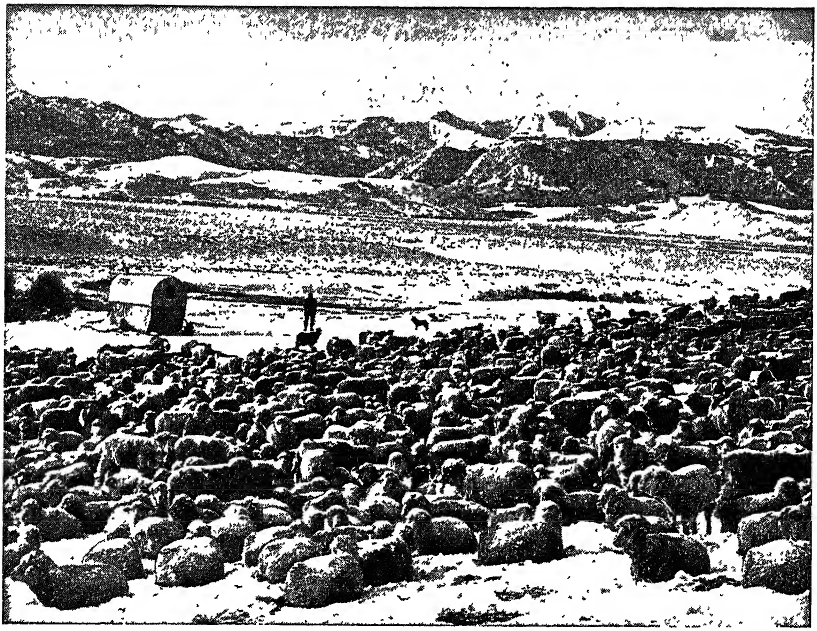


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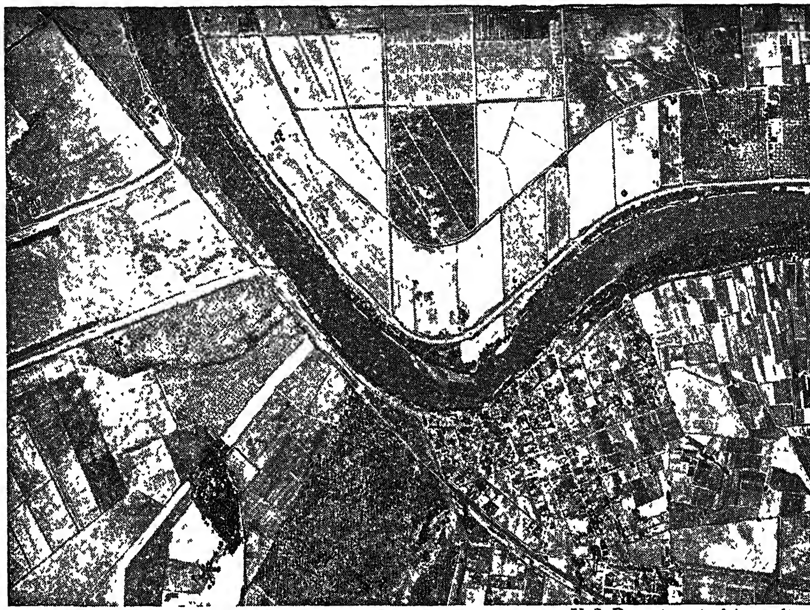
FIG. 10. A semiarid grassland utilized for grazing. A sheep ranch in Wyoming

farmer buys much of the food and other things his family needs. Some farmers try to combine the two types, and in many areas this represents the wisest use of the land.

Manufacturing. In everyday life, even primitive peoples make useful articles out of such raw materials as may be at hand. This form of manufacturing is done wherever people live. Manufacturing on a modern basis, however, implies large-scale operation and in many cases a widespread market for the finished product (Fig. 12). Large-scale manufacturing is confined largely to Western Europe and Eastern United States. The raw materials for the mills and factories in these areas are drawn not only from Europe and America but from practically all inhabited parts of the world. The finished products likewise are sold throughout the world. These manufacturing industries and the wealth and prosperity which they create distinguish the densely peopled regions in Europe and North America from all other parts of the world.

The Other Occupations. Transportation and trade, the eighth and ninth of our occupational groups, are concerned with the movement



U. S. Department of Agriculture

Fig. 11. Agricultural use of land. A farming area in Yolo County in the Sacramento Valley of California. The view shows the woods, the fields, and a farm village

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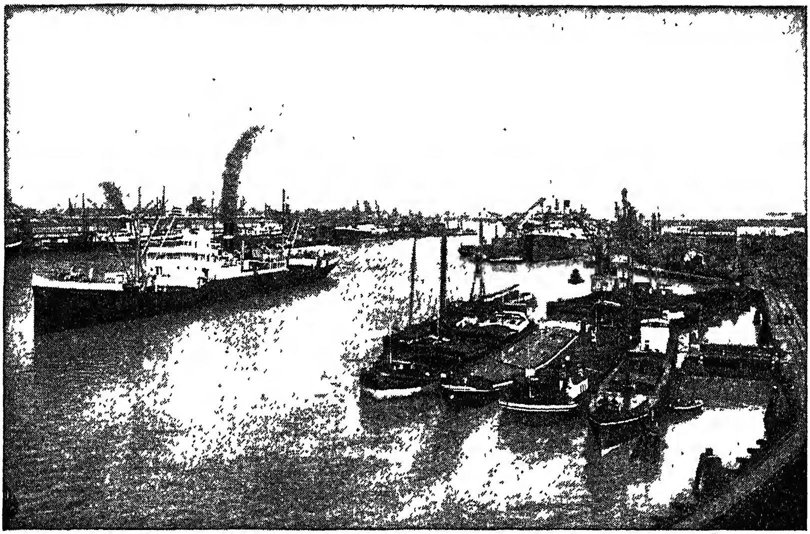
Fig. 12. Manufactural use of land. An automobile plant near Detroit, Michigan



Dr. J. Presser

Fig. 13. An area utilized for transportation. A section of the port of Amsterdam, the Netherlands

of goods from producers to consumers. They constitute our means of connecting peoples and regions. Though they do not produce goods directly from natural resources, they are aided or hindered in many ways by winds, waters, and other elements of the natural environment (Fig. 13). The tenth and final group includes the services of lawyers, government officers, musicians, and many others. This group is of vital importance to the people engaged in the other occupations.

QUESTIONS

1. Four large regions of the world and a few small areas are densely peopled. What are the large areas? Be prepared to locate on a map, or to describe the location of, the following smaller areas: Egypt, the Philippines, Java, and the south-central part of Mexico.

2. In general are the densely peopled areas near to the sea or far from it?

3. Are there more densely peopled areas in the Northern or the Southern Hemisphere? in the New World or the Old World?

4. What density or densities of population are shown by the map (Fig. 1) in (1) central Australia, (2) Florida, (3) Union of South Africa, (4) Eastern half of the United States, (5) Western half of the United States, (6) Eastern half of Canada, and (7) Western half of Canada?

EXERCISES

1. *Densely, moderately, and sparsely peopled regions*

a. In Mexico the moderately peopled areas surround the densely peopled area. Does this hold true in other parts of the world? Find five such examples.

b. Name ten countries which include large areas of moderate population.

c. What is the name of the large sparsely peopled area in Northern Africa (Plate VIII)? Look this name up in the gazetteer or an unabridged dictionary, and then explain why the area has but few people.

d. Judging by the picture, what is the density of population in the area shown in Figure 6? Figures 8, 9, 10, 11, and 12?

2. *Summary of distribution of population in the continents*

In studying the Commercial World, it is desirable to carry in mind a general idea of the distribution of population in each continent. Notice how the following generalized statements bring out the distribution of population as shown in Figure 1.

a. Practically all of Europe is occupied.

b. Most of the people in North America live in the southern two thirds of the continent.

c. Approximately half of Asia is occupied. Most of the people live in the southeastern third.

d. Most of the people of South America live relatively near the coasts. The great central region and the extreme southern part of the continent have but few people.

e. Most of the people in Australia live in the southeastern sixth of the continent.

f. In Africa the central belt, together with the northern and southern coasts, contains most of the population.

3. *How people gain a living in your community*

a. Which of the ten occupational groups are represented in your community? Name in writing one or more individuals or firms typical of each group represented.

b. Make a report on a selected occupation.

CHAPTER II

NATURAL CONDITIONS AND RESOURCES

1. *Natural Environment*

The earth, the home of man, is made up of land, water, and air. We live on the surface of the land and at the bottom of the air. The life zone, therefore, is at the contact of the land and the air, at the surface of the one and at the bottom of the other. In most areas the top of the land has been broken up and otherwise affected by the action of air and water and by the work of plants and animals. These slow-acting but powerful forces have led to the development of soil. The soil is not land, not air, not water, not plant or animal life, but is an independent natural body developed from all of them. Nature has developed the soil as an expression of all its elements.

Elements of Our Natural Environment. The elements of nature as they are combined in an area make up the natural environment of the area. Although the combination is never precisely the same in any two areas, nevertheless some regions are so similar that they are thought of as belonging to the same general type. Thus we think of the rainy mountainous coasts of British Columbia and Norway as examples of the same sort of area. As the elements of nature appear in about the same combination in both areas, the people who live in the one area have much the same outdoor experiences as those who live in the other. Their natural environment is of the same type.

Some of the elements of the natural environment are natural conditions, like climate, which men must face in carrying on their work. Others are natural resources, like coal, which are used as raw materials or in some other way. The elements have been named in various ways, but the following list governs the thought of this book:

location	surface features	mineral resources
size	water	native vegetation
climate	soil	native animal life

2. *Climate*

Climatically, the earth divides into five zones: the *low-latitude*, or *tropical, zone*; two *middle-latitude*, or *intermediate, zones*, one in the Northern Hemisphere, and the other in the Southern Hemi-

sphere; and two *high-latitude*, or *polar, zones*, one about the North Pole and the other about the South Pole (Fig. 14). From the standpoint of climate these are heat, or temperature, zones; for the low latitudes are always warm, the middle latitudes have definite seasons of warmth and cold, and the high latitudes are cold throughout most of the year.

Low-Latitude Climates. Except in the high mountainous areas the low-latitude, or tropical, zone is free from frost. This means that as far as temperature is concerned, plants can grow continuously. There is no real winter. Since many important crops, such as bananas, can produce fruit only by growing continuously for a year or more, the absence of frost in this zone makes it possible for these crops to be grown, provided sufficient moisture is available.

Contrasts due to elevation. Highlands are much cooler than lowlands, and even in low latitudes the highest mountains are covered with snow and ice. Even if the land lies only two or three thousand feet above the sea, the climate is modified enough for crops like coffee, which do not grow well on hot, steaming lowlands.

Contrasts in rainfall. Continuous heat is common to all lowlands of low latitudes. Continuous moisture is not. Some tropical lands, like the Amazon Basin, are moist throughout the year; some, like India, are moist through half the year and dry the other half; still other areas, notably the Sahara and Arabia, are deserts, dry at all seasons (Fig. 14).

In general, the areas which are warm and moist throughout the year lie along the equator and are open to the sea, the Amazon Basin of South America, the Congo Basin of Africa, and the East Indies being the outstanding examples. In general, also, the wet-season, dry-season tropical areas lie farther from the equator and are near the sea or open to it. The desert areas also lie away from the equator. In most cases they are located in the western parts of large land masses or are shut off from the sea by great mountain ranges.

Middle-Latitude Climates. Middle-latitude climates appear mainly in North America and Eurasia (Fig. 14). This is in harmony with the fact that in middle latitudes most of the land areas lie in the Northern Hemisphere. Note that in the Southern Hemisphere South America and Africa narrow down in middle latitudes and that only Australia has broad areas outside of low latitudes. Middle-latitude lands are characterized by a well-marked winter and an equally well-

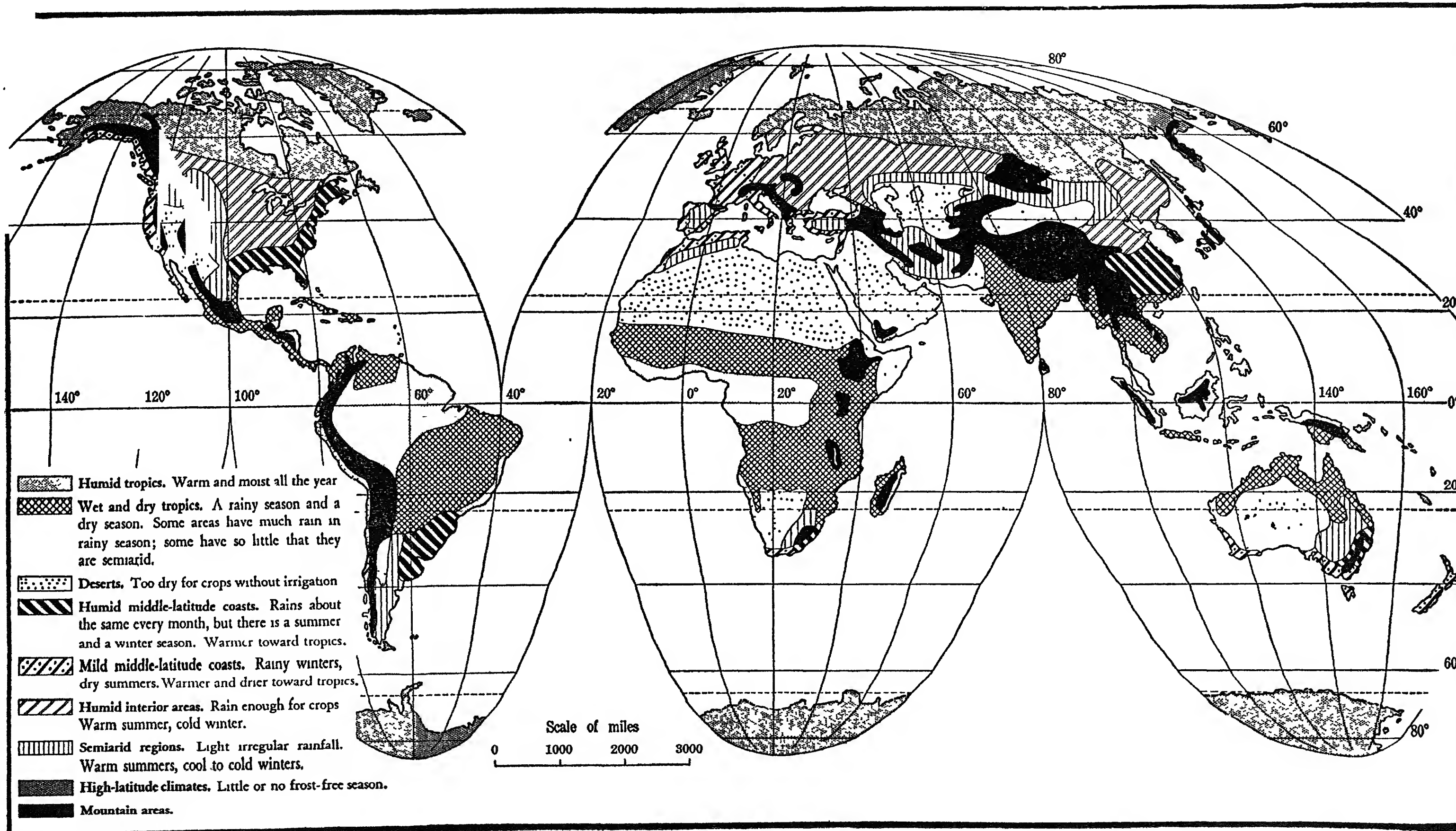


FIG. 14. Broad climatic divisions of the world. The divisions show the effect of latitude, altitude, and relation to the sea

marked summer. The growing season for plants lies within the period free from frost. Near the border of low latitudes the frost-free season is seven or more months in length, and some years may have no frost. Farther from the equator the frost-free season shortens, being about five months in Illinois and not more than three and a half months north of Lake Superior. Naturally these varying frost-free seasons affect the selection of crops for particular areas.

Well-marked spells of weather. Middle latitudes are strikingly unlike low latitudes in the important question of weather. In the latter the changes are slight, one day or week being much like every other day or week. In middle latitudes, however, the weather changes every few days. We have a procession of clear, cool spells and warmer, moist spells. These spells of weather move from west to east across the country, affecting our comfort, our crops, and our transportation in many ways.

Variations in moisture. Moisture varies notably in middle latitudes. Large areas, particularly those open to the sea, like Eastern United States, are moist throughout the year. Other areas, like Central United States, are humid, but receive more moisture in summer than in winter. Still others, like much of Western United States, are semiarid, with enough rain for crops in some years and not enough in others. Finally, there are middle-latitude deserts, where crops can be grown only by means of irrigation.

Contrasts in coastal and interior sections. Climatic conditions in the seaward margins of continents in middle latitudes differ from those in the interior section (Fig. 14). Because they are exposed to the sea, the coastal areas, as a general rule, receive more rain than areas farther inland. The seaboard sections, moreover, tend to be less hot in summer and less cold in winter than the interior sections.

Contrasts of west coast with east coast. In middle latitudes the mild qualities of climate are much more pronounced on the west coast than on the east coast, the reason being that in middle latitudes, as has been stated, the weather progresses from west to east. The west coast, therefore, gets much of its weather from the sea; and as the sea has about the same temperature the year round, the temperature of the air above it varies but little from season to season. The east coast, however, gets much of its weather from the continent, and consequently it, like the interior, has hot weather in summer and cold weather in winter.

Middle-latitude North America illustrates this contrast of western seaboard and interior conditions. Our west coast remains mild throughout the year, and the northern half is humid. Puget Sound and the lower Columbia River, for example, are not blocked by ice in winter, whereas navigation on the Great Lakes closes in December. Great Britain with its mild climate, and Soviet Europe, noted for its extremes of cold and heat, illustrate the same principle.

High-Latitude Climates. From the standpoint of crops and other forms of life the high latitudes have not much to offer. The frost-free season is too short and too cool. The ground freezes deeply, and in many areas the frost of one season does not get out of the ground before the cold of the next winter comes along. High-latitude areas fronting open sea on the west, however, are not severely cold. The ports of Norway are open throughout the year, and the Pacific coast of Alaska has a much less severe winter than the territory about the Great Lakes. Such coasts have much cloudy weather. One may spend a summer in Norway, for example, and witness only a few clear, sunny days. These areas which front the sea are exceptions. In general, climate definitely limits opportunity in high latitudes, reducing population to a few scattered fishing, grazing, or mining settlements.

3. *Surface Features of the Land*

People live on the land and derive most of their living from it. The surface of the land varies from place to place; it is low and level in some areas and high and rough in others. Most of the people of the world live in the lowlands because conditions are better there for most occupations. Not all lowlands are occupied, however; some are too dry, some are too wet, and some have too short a summer for human use (see Section 2 of this chapter).

How Surface Features are Classified. The surface features of the land fall into four groups: mountains, plateaus, hills, and plains. Most mountain areas and most of the great plateaus are highlands; in many cases the plateaus lie near mountain masses or are surrounded by them. In general, also, most plains are lowlands, and in many cases hilly regions are simply the rougher parts of the lowlands. In some parts of the world, however, hilly regions lie between mountains and plains, marking the change from one to the other.

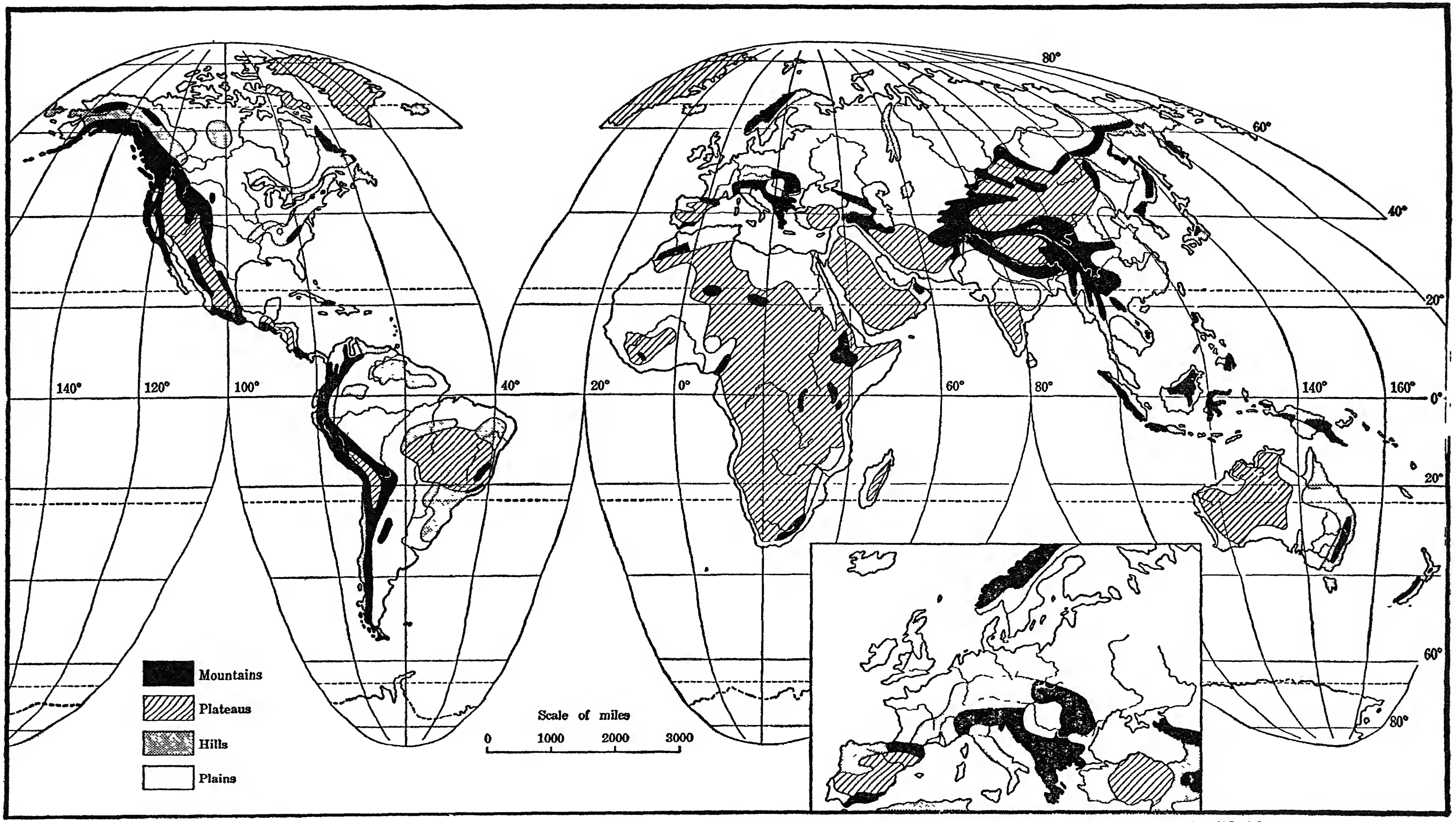
Distribution of Highlands and Lowlands. The mountains, plateaus, plains, and hilly regions of the world make up a highly irregular pattern, but some big features stand out clearly. In general, highlands border the Pacific Ocean (Fig. 15). This is well marked in North and South America, where the coast is flanked by long, high mountain ranges. In a broad sense it is also true in the Old World. Note the extent of highlands from Bering Sea southward through Eastern Asia, the East Indies, and eastern Australia. The plains of China only seem to emphasize this line of Pacific highlands.

The map shows two other great highland axes in the Eastern Hemisphere. The first extends from the extreme northeastern corner of Asia in a southwesterly direction to the southern point of Africa. Along this line lie such notable highlands as Tibet, Iran (Persia), Arabia, Ethiopia, and Central Africa. The other great highland axis extends from the East Indies northwestward by way of the Himalaya Mountains and the Plateau of Tibet to the Caucasus Mountains, thence continuing by way of the Balkans, Carpathians, Alps, and Pyrenees to the Atlantic. Note that the greatest highland in the world—the Plateau of Tibet and the Himalaya Mountains—occurs at the intersection of these great lines of Old World highlands. Singularly enough, the greatest depth of the sea occurs not far distant, off the Pacific coast of Asia.

In general, the lowlands of the world face the Atlantic. This is particularly noticeable in North and South America, but it is also true of Europe and to a degree of Africa. Knowing this, one can begin to understand why much of the production of crops in the world is in the lands tributary to the Atlantic Basin and why the traffic across the Atlantic, particularly the North Atlantic, is by far the greatest ocean traffic in the world.

There are, of course, great lowlands tributary to the Pacific and Indian oceans (Fig. 15). The Ganges and Indus plains of India are occupied by millions of people. The plains of China are noted for their productivity, but most of Eastern Asia is made up of hill country. Australia has great plains and low plateaus, but unfortunately most of the country is too dry for human use.

Mountains. High altitudes and steep slopes characterize mountain areas. The traveler in such regions nearly always goes up or down. "Double-headers" on trains, boiling water in the radiators of automobiles, and swiftly flowing streams with many rapids and water-



Modified from Jones and Whittlesey

FIG. 15. Major surface features of the world

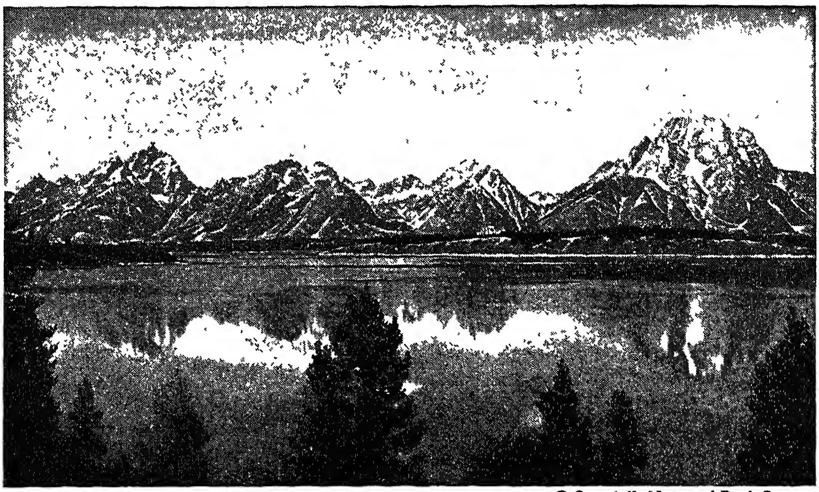


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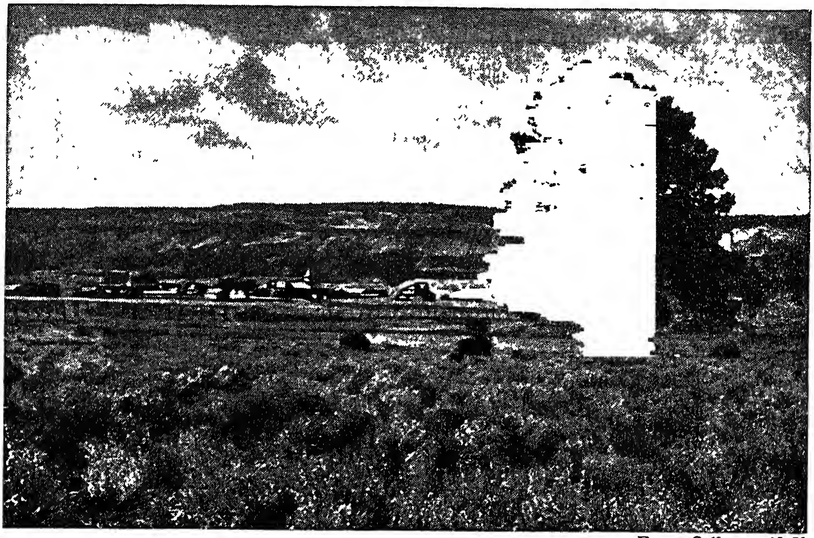
FIG. 16. A mountainous area, the Grand Tetons in Wyoming. In mountain areas the slopes are steep and the summits tower high above the valley bottoms. Such areas are said to have great relief. In many mountain areas the valleys are cultivated, whereas the slopes are in pasture or forest

fails give evidence of the ever-present slopes. In many cases deep valleys are as conspicuous as the lofty peaks. There is variety in every view (Fig. 16).

The extent to which mankind makes use of mountain areas depends on the relation of the mountain mass to other areas and also on the arrangement of ranges and valleys which make up the mass. The Alps, for example, lie between highly productive regions in Germany and France at the north and west and the most productive part of Italy at the south. To the traffic between these productive areas the mountains constitute a barrier. The main mass of the mountains extends east and west, and even the best passes are not easily reached by railways. The lines from the north, therefore, follow valleys leading up to the passes as far as practical and then, by means of long tunnels, pierce through to the south flank of the mountains.

Mountain areas are both favorable and unfavorable for human use. Fertile valleys may invite settlement, but such settlements may be separated from markets by difficult country. Roads and railroads must follow the grain of the country or else construct costly grades, switchbacks, and tunnels. Steep slopes may be cultivated, but at the expense of building terraces to keep the soil from washing away.



Ewing Galloway, N. Y.

FIG. 17. A plateau near Santa Fe, New Mexico. In the background of the view the steep face of the plateau rises abruptly above the general surface. The steep face is called an escarpment. The top of the plateau is nearly level

Alpine meadows support livestock through the summer, but winter snows drive the herds into the valleys. Mountain scenery attracts visitors; but, again, the rigorous winter limits the tourist season in most areas to a few months. Deep-cut valleys may expose to view the mineral resources contained in deep-seated rocks. The mineral areas, however, may be so difficult to reach that it is impracticable to get the ores to market. High mountains in arid regions act as rain-catchers; but the water may not be used for irrigation until it has flowed to a broad valley floor or even to a plain outside the mountain area.

Plateaus. A plateau is a tableland, that is, an upland with a broad summit area distinctly higher than the surrounding land on at least one side (Fig. 17). The surface of a plateau may be broken by mountain ranges or peaks, and in most cases is cut by deep canyons, as in Arizona the Colorado Plateau is cut by the Grand Canyon. In some cases plateaus are almost completely surrounded by mountains—the Great Basin of Nevada and Utah, for example.

In their world distribution, plateaus and mountains make up the great highlands. In addition to the broad plateau regions mentioned on page 22, there are great plateaus in India, western Australia, Spain,

Ewing Galloway, N. Y.

Fig. 18. A hilly area in Virginia. In such areas the steeper slopes are not well suited for cultivation. The lower slopes and the valleys are cultivated. This means that most of the people live in the valleys. Roads and railroads conform to the surface by following the valley floors or the tops of the ridges

Eastern Brazil, Mexico, and Western United States. Some plateaus support important agricultural industries, but many of them are too high and dry to be of great service for agriculture.

Hilly Regions. Hilly regions (or hill country) consist of rough, rolling, or broken areas where the elevation is not so high nor the ups and downs so great as in truly mountainous areas (Fig. 18). Typical hill country may be rolling land where the hills are rounded and the valley slopes smooth, as in the Finger Lake section of New York. Or it may be a maze of roof-shaped ridges and V-shaped valleys, as in eastern Kentucky and West Virginia. It may consist of alternate low ridges and narrow shallow valleys, as in central Pennsylvania or the Shenandoah section of Virginia; or it may be a broad foothill area in front of a higher mountain mass.

In many instances hill country supports a large number of people. The valleys may be fertile and some of the slopes be suited to vineyards or other forms of fruit culture. Where rainfall and soils are suitable, grassy slopes may be pastured and forests maintained as a steady source of income. Since much of the land is in slope, it must be handled properly or rain will wash and cut the surface so badly as to

Fairchild Aerial Surveys, Inc.

FIG. 19. A section of the Central Plain near Wilmington, Illinois. Here all the land is suitable for cultivation, but some of it is used for habitations, roads, and railroads

make it unfit for further use. Some of the great mining areas of the world are in hill country.

The world map shows that hill country borders some mountain areas, a notable example being the "Alpine Foreland" north of the Alps. Southeastern China is the largest and perhaps the most typical area of hill country in the world. Here agriculture has been practiced for many centuries, and the hills and valleys support a dense population. The eastern part of the United States contains much hill country; in fact, the Appalachian Highland is a vast area of hill country.

Plains. A plain is an area of level or nearly level land (Fig. 19). Slopes within a plains area are gentle rather than steep, and in some plains the land has so little slope that the drainage is slow and swamps and marshes cover the surface. The Everglades of Florida and the marshes of eastern Poland are plains of this type. Some plains—for example, the Prairie Plains of Alberta and Saskatchewan—are cut into vast blocks by the deep valleys of the rivers which drain them. In general, the plains of the world are areas where the land lies level enough for the plow and where roads and railroads mav be laid out according to a man-made survey rather than according to a natural

pattern of ridges and valleys. Although this quality of levelness holds true in general, plains display many small features: river valleys, low hills, shallow basins, all giving variety to the view and to the use of the land.

4. *Water Resources*

The Moisture Cycle. Warm winds bring moisture from the sea to the land. At times this moisture is condensed and falls as rain. Some of the water runs off the land where it falls, some sinks into the ground, and some is evaporated into the air. Of that which runs off, some part may be held for a time in a lake or a swamp or a marsh, but eventually it returns to the sea. This cycle, made up of evaporation from the sea, the movement of moisture-laden air inland, the condensation of water vapor into rain, and the flow of water back to the sea, is one of the great processes of nature. No act of man can halt this process; but when water falls on the land, when it has soaked into the soil, and while it is flowing to the sea, mankind uses it in many ways.

Our inland water resources include (1) running water in brooks, streams, and rivers; (2) standing water in lakes, swamps, and marshes; and (3) underground water—that is, water which has soaked into the ground. The use of water in an area may involve any one or all of these types of water bodies.

Running Water. A river and its tributary streams make up a drainage system; the area they drain is called a drainage basin. The total number of drainage basins in the world is large, too large to be shown clearly on a single map. The largest fifteen basins, however, are shown in Figure 20. Seven of them drain into the Atlantic, if we consider the Mediterranean and Black seas as arms of that ocean; and only one to the Pacific, the largest of the oceans. The great flow to the Atlantic is in harmony with the fact that the great lowlands face the Atlantic. As we shall see presently, this combination of great plains and great river systems contributes much to the high commercial importance of lands facing the Atlantic.

River basins have individuality. Each of the great drainage basins has its own distinctive characteristics. The Amazon, fed by tropical downpours, is a deep and mighty stream, and ocean-going vessels ply it almost to the Andes. The Nile, flowing through a desert, is one of the ancient sources of irrigation. The Mississippi drains a fertile

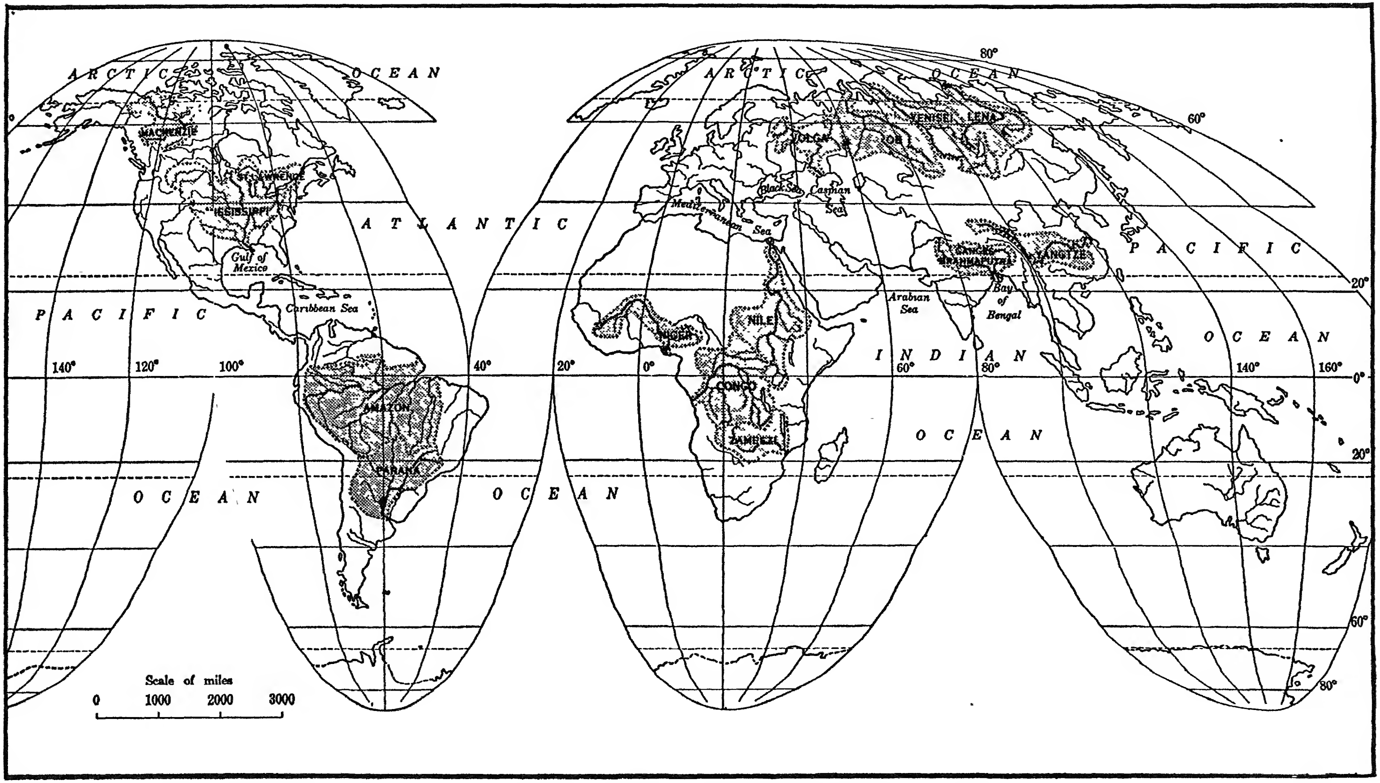


Fig. 20. The largest fifteen drainage basins in the world

middle-latitude lowland. The great river systems draining to the Arctic are frozen during much of the year. These Arctic basins support only scattered settlements, whereas the Ganges and Yangtze basins are densely peopled.

Small rivers may be highly useful. The usefulness of a river may depend upon other things than its size. If rivers were ranked on the amount of their use to society rather than on the size of their drainage basins, the leading fifteen rivers would not be the same as those shown in Figure 20. The little Thames, serving the port of London; the busy Rhine; the lower Hudson, with its never-ending traffic; and the short Niagara, with its tremendous power,—all take high rank among the useful rivers of the world.

Problems in use of running water. The wise use of running water calls for a thorough understanding of the behavior of streams. The runoff varies with the rainfall—more in some seasons, less in others. If heavy rains occur, freshets and floods may follow, and these in some cases cause great damage to farm land and cities. On the other hand, during prolonged droughts stream flow diminishes, at times to the point where the streams dry up. If water becomes too low, river craft may get stuck on sand bars, city water supplies may be endangered, hydroelectric plants may not have enough water to turn the turbines, and the river may not have sufficient flow to carry away the sewage of cities along its banks. Regularity of flow is highly desirable in a river, but few rivers have it.

Standing Water. Some drainage basins contain bodies of standing water; in fact, many streams rise in lakes, swamps, or marshes. Along their courses, moreover, some rivers—the Mackenzie in Canada, for example—flow through lakes, the lakes acting as natural reservoirs and helping to equalize the flow of the water. The Great Lakes, for example, discharge water so constantly into the St. Lawrence that the river has a remarkably regular flow throughout the year. This means a constant supply of water for the power plants at Niagara and an even depth of water for vessels plying the river below Montreal.

Large lakes, such as the Great Lakes, are much used for transportation, especially for iron ore and other heavy products. Lakes too, both large and small, are prized the world round as sources of drinking water ~~and for recreational~~ purposes. Men like to fish and swim and sail. No one can estimate the value of such recreational areas in the sum total of human welfare.

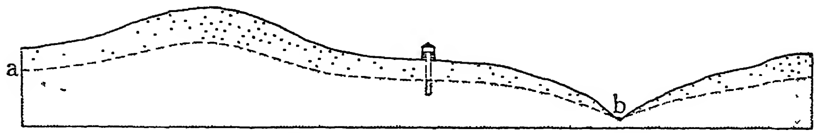


Fig. 21. The water table. The broken line a–b represents the water table, or the top of the saturated part of the ground. In order to yield a steady supply of water, a well must extend below the water table as in the drawing

Swamps and marshes indicate level land and sluggish drainage. Like the lakes, they help to equalize the flow of streams. Swamps occur at intervals along the Atlantic coast from Florida to New Jersey. Some of these swampy areas contain fine stands of cypress and other useful timbers. All of them furnish refuges for migratory birds, and from some of them we get muskrats and other fur-bearing animals. Similar swampy lowlands occur about the North Sea in Europe and in many other coastal areas. In the Netherlands, the coast of Germany, and the east coast of England these low, level, swampy areas have been drained. The land has turned out to be highly productive (Fig. 234), thus rewarding the people for their great expenditure of money and effort.

Underground Water. The ground absorbs great quantities of water, and these underground supplies are essential to plant, animal, and human life. The amount of water in the ground varies with the precipitation and with the nature of the ground. If the ground is porous and contains many cracks and crevices, much water sinks in; if the opposite is true, the ground absorbs little or no water. After a prolonged rain the ground may be completely soaked; the water sinks into the ground, and if a dry spell follows it may leave the upper ground dry. But somewhere below the surface the tiny spaces between the grains of sand or other materials are filled with water. The top of this saturated part of the ground is the water table (Fig. 21). In solid rock the water fills the cracks or the pores between the tiny particles which make up the rock. If the rock has no pores or if it is not broken by cracks, it cannot hold water. Wells driven into such rock would not find water, whereas in many places wells are driven into water-bearing rock and yield abundant supplies.

On many hill slopes the ground water seeps out slowly from the saturated ground, its presence shown by a patch of damp ground or a belt of small springs. Such springs feed water into the streams,

giving them a steadier flow than they would have if they depended entirely on surface runoff. Some streams are fed almost entirely by seepage from underground waters. If caves or large crevices occur below the water table, they will become filled with water, in some cases forming great underground reservoirs. From these, water may flow in underground channels. In some places these underground streams appear on the slopes of hills as great springs.

Ground water is particularly important as a source of drinking water. Probably 70 per cent of the people of our country obtain their drinking water from underground supplies. Water is obtained by sinking wells down to a depth well below the water table. Water collects in the wells and is pumped to the surface. In some areas the water table lies several hundred feet below the surface of the ground, and deep-driven wells and power pumps are required to obtain it.

Uses of Water. Throughout much of the world, the ability of regions to support population depends on the supply of water. This means that the use and control of water is of basic importance in the life of a nation. Although the uses of water are legion, they can be grouped under the following ten headings.

1. *Drinking water.* Every farmstead, ranch house, and village must have a supply of drinking water, and the maintenance of an abundant supply of water is a major problem for great cities.

2. *Navigation.* Streams, lakes, and oceans furnish natural routes for the transportation of goods, in some cases at surprisingly low cost.

3. *Power.* Electricity, one of the major forms of power and light, is generated at points where streams have been harnessed by building dams and power plants. Great quantities of water, moreover, are required in plants where steam power obtained from coal is converted into electrical power.

4. *Irrigation.* The practice of reclaiming arid land by bringing water to it is known as irrigation. Water in many cases is brought from near-by mountains which have more rain than the lower lands.

5. *Fire protection.* Water under pressure is the major means of fighting fire.

6. *Mining operations.* Water is employed in many mining operations, such as separating gold from gravel, dissolving deep-seated beds of salt, and, under pressure, in some types of excavating.

7. *Industrial uses.* Modern manufacturing requires large quantities of water to wash, finish, and dye textiles, to aid in the manufacture of wood pulp and paper, to cool the jackets of great furnaces and machines, and for hundreds of other purposes.

8. *Drainage.* The principal use of streams in humid lands is to drain the land. Flowing water, moreover, carries away the waste and sewage of thousands of cities.

9. *Recreation.* Lakes, rivers, the seashore, and the swimming pools of our parks furnish recreation to millions of people each year.

10. *Soil moisture.* Moisture in the soil is essential to plant growth.

5. *Soil and Vegetation*

Soil and Plant Life. Soil, plant life, and crops directly or indirectly concern all people. Plants take root and grow in the soil, and thus the soil is essential to them. Plant life in turn is essential to soil; for soils cannot develop without the organic matter supplied by plants. Plants are also essential to other forms of life. Wild animals eat what they can find, living directly off nature. Man, however, through his system of crop selection, decides which plants shall grow and which shall be weeded out. In growing a crop he cultivates the soil. If he cultivates skillfully, he gets large returns over long periods of time; if not, he may destroy the soil in a few years, thus losing a resource which nature took long ages to create.

What Is Soil? (Soil is a combination of mineral materials and organic matter.) Commonly it contains air and water and teems with bacteria and fungi, tiny organisms essential to soil development. The soil lies at the surface of the land and ranges in depth from a mere film in some areas to as much as ten feet or more in others. It differs from the material lying beneath it in color, texture, chemical composition, and in many other ways. Beneath the soil lies the mantle rock, a body of weathered, broken-up rock materials. The mantle rock in turn rests upon the bedrock, of which the earth as a whole is composed.

How Soils Were Formed. The story of the soil began when the solid rock, or bedrock, was exposed to air. In time weathering took place. Heat and cold, freezing and thawing, and other forces caused the rock surface to buckle and break, as do our road surfaces in very

cold winters. Chemical processes like rust slowly crumbled the rock face. Wind, running water, waves, and ice wore at the rock, carving it, tearing it, and pounding it to pieces. Water soaked into the rock, dissolving out some material and leaving the rock more open to weather action. Gradually the surface rock broke up and a layer of loose material accumulated. Because this loose material mantles the underlying solid rock, it is called mantle rock (Fig. 22).

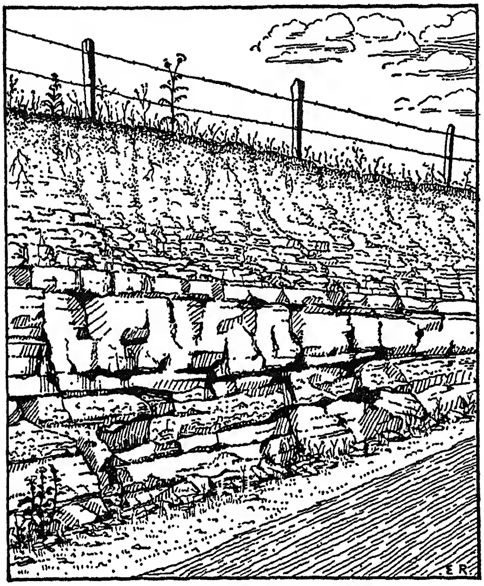


FIG. 22. Bed rock and mantle rock. Note the solid rock below, the broken rock in the middle, and the crumbled materials on top

Eventually the upper mantle rock was broken into small particles called gravel or sand or silt or clay, according to size. Such materials constitute the parent material out of which soils were formed. Most soils contain a mixture of particles of different sizes. Thus according to mixtures of coarse and fine particles, there are six principal groups of soils: sands, sandy loams, loams, silt loams, clay loams, and clays. The sands are coarse, containing less than 20 per cent of silt or clay. The loams and clays, however, are made up of fine particles and contain only small amounts of sand.

In the formation of soil the roots of trees, grasses, and other vegetation were highly important. As the parent rock accumulated, some organic matter was introduced at the surface by plants and animals. Simple plants such as lichens, which can attach themselves even to bare granite, slowly prepared the way for higher forms. In time grasses or trees became established. These are the kinds of vegetation most important in soil formation. The accumulating roots, leaves, and other organic matter gradually added humus, in many cases shown by a surface layer of darker color. In this humus lived great numbers of bacteria and fungi—tiny organisms too small to be seen

by the naked eye, but visible under a microscope. These tiny organisms decomposed the organic matter and further prepared it for plant use. Thus by a complex process extending back through the ages the surface material was so changed that it became entirely different from the material beneath it. This upper changed material is the solum, or true soil. It is our most precious heritage from the past.

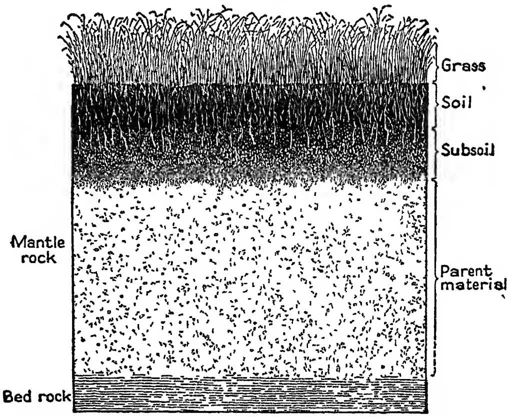


FIG. 23. A drawing to illustrate the relation of soil, subsoil, and parent material. The upper layer, or true soil, is all-important in crop production

The soil is not the same throughout its entire depth (Fig. 23). In almost all areas the upper, thoroughly changed layer is not more than eight or ten inches thick. This upper layer is all-important in crop production because (1) it is the feeding zone of many of our food crops, for their roots do not extend much more than a foot below ground; (2) it is the layer which is cultivated; and (3) it is the layer to which fertilizer can be applied. Below the top layer (or solum), partly changed material extends to an average depth of about ten feet. This partly changed layer is the subsoil. The different layers are called horizons; and all the horizons, viewed together, as on the face of a road cut, make up a soil profile. Soils are named and classified by examining their profiles. Thus where cuts are not available, soil students have to bore into the soil with a soil auger.

Significance of Soil. The significance of the soil lies in its ability to furnish water and nutrients to plants. A fertile soil contains elements needed by plants—nitrogen, phosphorus, potassium, carbon, iron, sulphur, calcium, and the like. The plant roots select what they need and drink it in, dissolved in water. At the same time the leaves of the plant under the action of heat and light take in carbon and oxygen from the air. In the green parts of the plant these nutrients are changed to the foods on which the plant lives.

As plants can draw from the soil only such minerals as are dissolved in water, the ability to hold water is an important soil quality. The amount of water in the soil depends in part on the amount furnished by rain and in part on the proportion of coarse and fine materials in the soil. In general, coarse, sandy soils do not retain water as well as the loams and clays. Certain bacteria in the soil, moreover, make the mineral particles more readily soluble in water. As the soil bacteria are healthier if they have plenty of air, stirring or cultivating the soil helps in this respect. In fact, many plants will not grow in soils so saturated with water that air cannot get in.

In many areas the soils lack some of the minerals needed by plants. In that case the farmer must add manure or other fertilizers containing the needed elements. Nitrates, phosphates, potash, and lime are much in demand in the fertilizer industry because they contain the elements most commonly lacking. Nitrogen can be obtained by growing clover or other legumes because bacteria which grow on their roots take nitrogen from the air. Eventually this nitrogen becomes fixed in the soil.

Productivity of Soil. The productivity of the soil—that is, what it brings forth—depends upon several things, including the quality of the soil, the weather during the growing season, the quality of the seed, the fertilizer used, and the way in which the soil is handled. Poor seed remains poor even if planted in the best of soil; if the soil lacks certain important minerals, the farmer must use a fertilizer which will add the needed minerals. He must cultivate the soil too in accord with the climate. To prepare a seed bed with a fine mulch surface is good practice in a humid region, but in a semiarid region it is risky. A hot, dry wind may blow the mulch away before the crop is up. Farmers must always contend with the weather. Many a crop that looked fine in June has been severely damaged in July by too much rain, a severe windstorm, or a prolonged dry spell. Many conditions, therefore, affect the productivity of even the most fertile soils.

The Relation of Soils to Climate and Vegetation. Although locally soils are related to surface and drainage features, their broad distribution resembles that of climate and vegetation. In fact, a map of native vegetation serves as an introduction to the great soil groups (Fig. 24). Since much of the original forest and grassland has been brought under cultivation, crops have replaced the native vegetation. The soil, however, remains with us unless we permit it to wash or blow away.

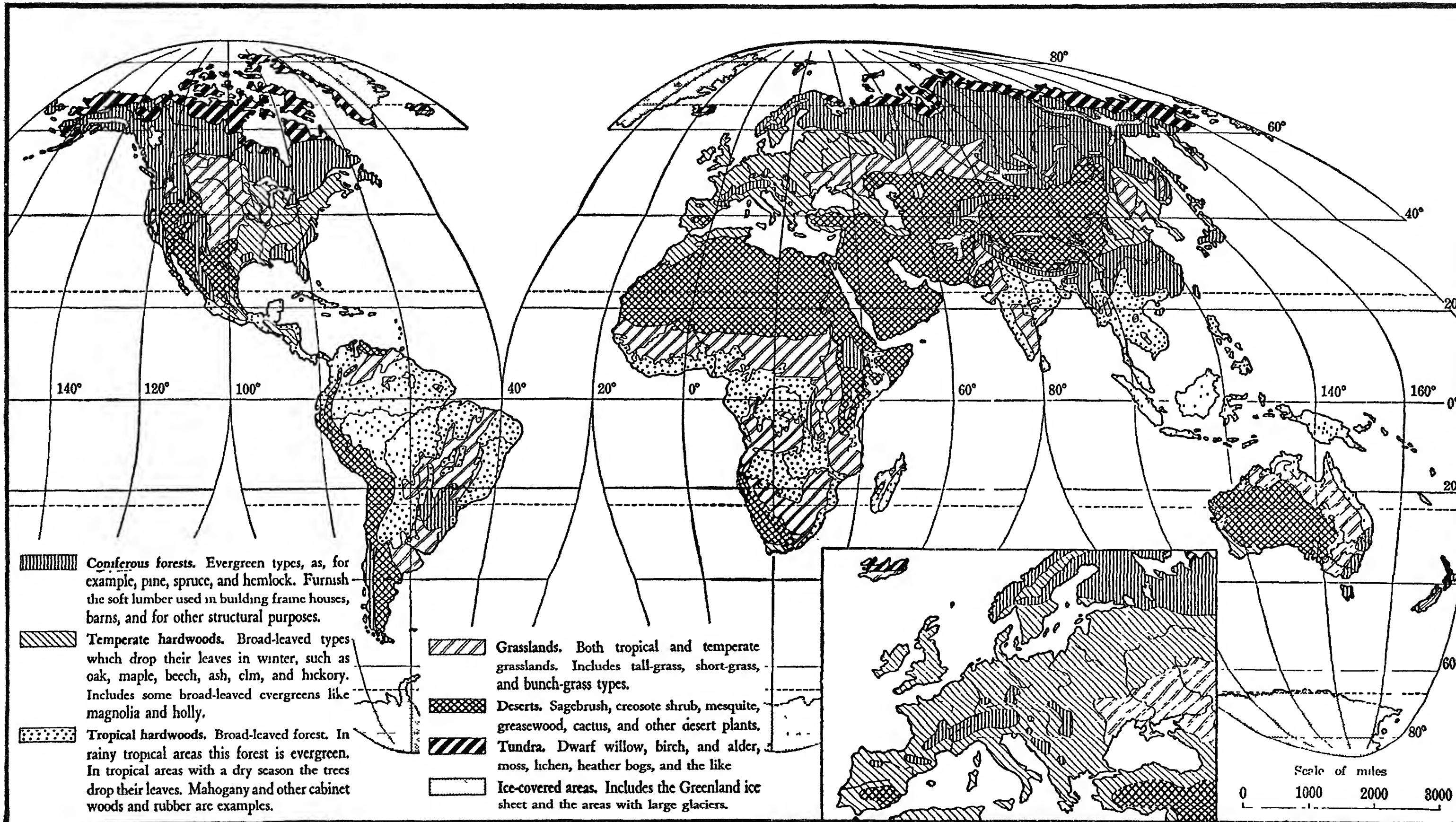


FIG. 24. Forests, grasslands, and deserts of the world. Much of the original forest and grassland is now used for agriculture

Grasslands and grassland soils. Before man began to cultivate, grasslands occupied the areas less humid than the forests and more humid than the deserts. The vegetation native to these areas was grass—tall grass in the moister sections, short grass in areas with less moisture, and bunch grass at the border between the grasslands and the desert. The distribution of the grasslands before large areas were brought into cultivation is shown in Figure 24. Some lie in low latitudes and others in middle latitudes, thus showing that there are both tropical and temperate grasslands. Each continent has one or more grassland areas, the prairies and plains of Central United States, the Pampa of Argentina, and the steppes of the Soviet Union being world-famed examples.

In general, the grassland soils are fertile, some of them being our most fertile soils. This fertility is due partly to the large amount of humus with which the grasses charge the soil. Grasses have an amazingly compact root system which thoroughly occupies the soil and forms a dense sod. The mature root system consists of a vast network of main roots and masses of finely branched rootlets which extend downward to a depth of two or more feet, the deeper roots extending to four or five feet. This mass of organic material has produced black soils very high in humus. The climates of the great grasslands stimulate the growth of the bacteria that help to decompose minerals and humus into fine particles (pp. 34–35) and thus enable the soil to hold more water for the roots of plants. Because of the restricted rainfall, moreover, not much mineral matter is leached from the soil by water, and in many areas the soils are so rich in mineral nutrients as not to need fertilizer.

Although the grassland soils rank as the most fertile soils, they are not necessarily the most productive. The grasslands are subject to years of drought, when crops are poor or fail entirely. Over a period of twenty years, for example, grassland areas may not produce as much as less fertile soils in areas of more dependable rainfall. Farming areas of grassland soil, therefore, always involves the hazard of the exceptionally dry years. This hazard is greater in the more arid sections. In such areas dry seasons come so frequently that the best use of the land is for grazing rather than for farming.

Desert and desert soils. Desert vegetation is sparse and is adapted to scanty rainfall, with long intervals of heat and drought (Fig. 25). The vegetation includes such types as sagebrush, creosote shrub, cac-

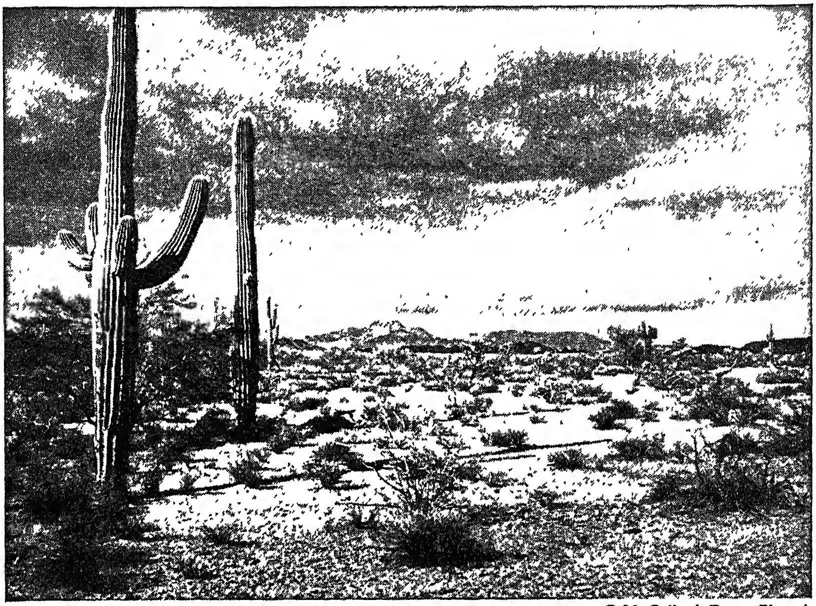

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FIG. 25. Desert vegetation in southern Arizona. The desert shows much bare soil. In the search for water, plants send roots deep into the earth and spread long near-surface roots through as much of the surrounding soil as possible

tus, and greasewood. The soils contain little or no humus and can support only a sparse population, except in the oases, where water is obtained from wells, springs, or streams. The world's largest expanse of desert extends from the Atlantic coast of northwestern Africa across the Sahara and Arabia into central Asia.

Forests and forest soils. Forests cover 22 per cent of the land area of the world, not counting the polar regions. Only about three fourths of the forested area, however, produces lumber or other useful things. The other fourth is characterized by stunted or overripe timber of no commercial importance. Centuries ago, before much of the original forest was cleared for farming and before large-scale lumbering led to extensive forest fires, the forested areas were much larger than they are now (Fig. 24). Today the largest forest areas are in the Soviet Union and the British Empire (including Canada), each possessing about a fifth of the world's forest. Next come the United States and Brazil. These four political divisions, taken together, have about two thirds of the forest lands of the world.

Three main groups make up the world's forests: the conifers (35 per cent of the total), the temperate hardwoods (16 per cent), and the tropical hardwoods (49 per cent). Commercially, the first two groups are the important ones: the first supplies lumber for building houses, barns, and the like; the second, hardwood for interior trim, furniture, and many other purposes. Most of the coniferous forest and the temperate hardwoods lie in the Northern Hemisphere, stretching in a great belt across Europe, Asia, and North America (Fig. 24). In terms of use this location is fortunate as it places large forested areas near the major market areas of Europe and the United States.

The soils of forested areas are on the whole less fertile than those of the grasslands. Forest soils contain less humus because the roots of trees make up a less compact mass than those of grass. The roots, moreover, grow much deeper into the subsoil, thus furnishing less organic matter to the topsoil. The humus content is especially low in the coniferous forest, which returns little leaf mold or other organic matter to the soil, and which in many cases occurs in cool, moist areas, not well suited to bacteria. These soils, moreover, are notably deficient in soil minerals because the excessive moisture carries away the minerals in solution.

Temperate hardwood forests originally covered much of Eastern United States and Western Europe. Because of the annual leaf fall, the soils formed in these forests contain more humus than the soils of the coniferous areas. They also contain a greater amount of the essential minerals. Typically, they are deficient in lime or some other mineral and require the use of fertilizers. Much of our knowledge of fertilizers comes, in fact, from England, Germany, and other countries where, for many years, farmers and scientists have sought ways of improving the medium-grade soils of temperate hardwoods. It is not surprising, therefore, that these soils have been called the soils of Western civilization.

6. *Mineral Resources*

Minerals and Rocks. Thus far we have dealt with surface conditions and surface resources. What other riches has Mother Nature to offer? The answer is found underground in the rock itself and in the minerals with which the rock is enriched in some places.

Construction materials .	Limestone, sandstone, slate, granite, marble, glass sand, cement rock, clay, asphalt, etc.
Fuels	Coal, petroleum, natural gas, peat
Industry	Aluminum ore (bauxite), antimony, asbestos, barite, chromite, copper, fluorspar, graphite, gypsum, iron ore, lead, magnesite, manganese, mercury, mica, nickel, platinum, pyrite, sulphur, talc, tin, tungsten, vanadium, zinc
Fertilizers	Phosphates, potash, nitrates, greensands, etc.
Precious stones	Diamond, tourmaline, opal, ruby, etc.
Abrasives	Garnet, corundum, diamond, sand, sandstone, etc.

FIG. 26. Commercial minerals classified as to use

To win these underground resources, we must dig or bore into the earth's crust. In some places streams have done the down-cutting for us and have exposed mineral bodies along their valley walls. In other places the ore-bearing bedrock may be exposed at the surface or be thinly covered with mantle rock. In such places a railway cut or an excavation for a building may reveal the valuable ores. In any case, when prospecting has shown that a valuable mineral is present, we mine or bore for it. Until recent times, mines and borings went down only a few hundred feet; now, with the aid of new tools and machinery and better methods of ventilation, some mines are more than a mile deep and some borings go down to almost 8000 feet.

Major Minerals of Industry and Commerce. The list of minerals which have some value is long, but the minerals of large importance in trade and manufacture are relatively few. For convenience of reference these minerals are classified in Figure 26 according to major uses. Most of them are produced in some quantity in the United States.

Mineral Deposits. Most of the minerals used in construction are dug from the mantle rock or are quarried where desirable bedrock is exposed at the surface (Fig. 27). Sand, gravel, and clay, for example, are homely everyday things, but they are of much importance in the building trades. They are easy to obtain because they lie at or near the surface of the ground, and often they are dug with steam shovels. Commonly they are cheap. Their occurrence in large beds is due to the fact that they have been sorted out by water. Swiftly moving water carries rocks and gravel as well as sand and mud. When the current slows down, the heavy stone and gravel are dropped. Further slowing down means that the relatively heavy sand will be deposited, leaving only the mud and silt in suspension. In quiet water

even these will be laid down. As a result of this sorting, the mantle rock in some localities contains big beds of gravel much prized for highway construction or railway ballast, beds of clay for brick manufacture, or beds of sand for making glass, plaster, or concrete, and for sanding tracks and roads in icy weather. In areas not supplied with natural gravel, ballast for highways and railways is obtained by crushing stone from some out-cropping bed.

Most of the valuable mineral deposits are associated with the bedrock, which underlies the mantle rock. There are two major kinds of bedrock—sedimentary and crystalline. Sandstone, shale, and limestone are examples of the former; granite and marble, of the latter. Sedimentary rock is nothing more than consolidated sediments held together by some cementing material. Thus sandstone is cemented sand, and shale is cemented mud. Crystalline rocks consist of tiny crystals and make up the vast body of the earth. In many areas bedrock is quarried and used as building material and for other uses where strength or beauty is desired.

Metals commonly occur as ores (that is, mixed with or united with other minerals) in bedrock. Either crystalline or sedimentary rock may contain ores of iron or other metals, but ore deposits are the exception rather than the rule. In fact, large areas of bedrock contain no valuable ores. In many cases the ores occur in veins or seams in the bedrock, where for some reason they have been concentrated. In order to get the metals, it is necessary to mine the ore and then to separate the valuable metal from the rest of the ore by crushing, washing, smelting, or some other process. Mining and treating ores is expensive, however; in some cases so expensive as to make the operating of a mine unprofitable. In some areas, when one metal is extracted from its ore, other minerals are obtained as by-products. Thus Canadian nickel ore also yields copper and some silver and platinum.

The whole story of ore deposits is highly complicated. Our interest lies in the fact that in some areas rich bodies of ore lie near enough to the surface to enable us to mine them. This combination of rich and accessible ores is present in all great mining camps—for example, in Virginia and Hibbing, Minnesota, with their open-pit iron mines; in Bisbee, Arizona, with its copper; and in Johannesburg, South Africa, with its rich veins of gold.

In addition to ore deposits, the sedimentary rocks may contain coal, petroleum, or natural gas—minerals whose presence carries

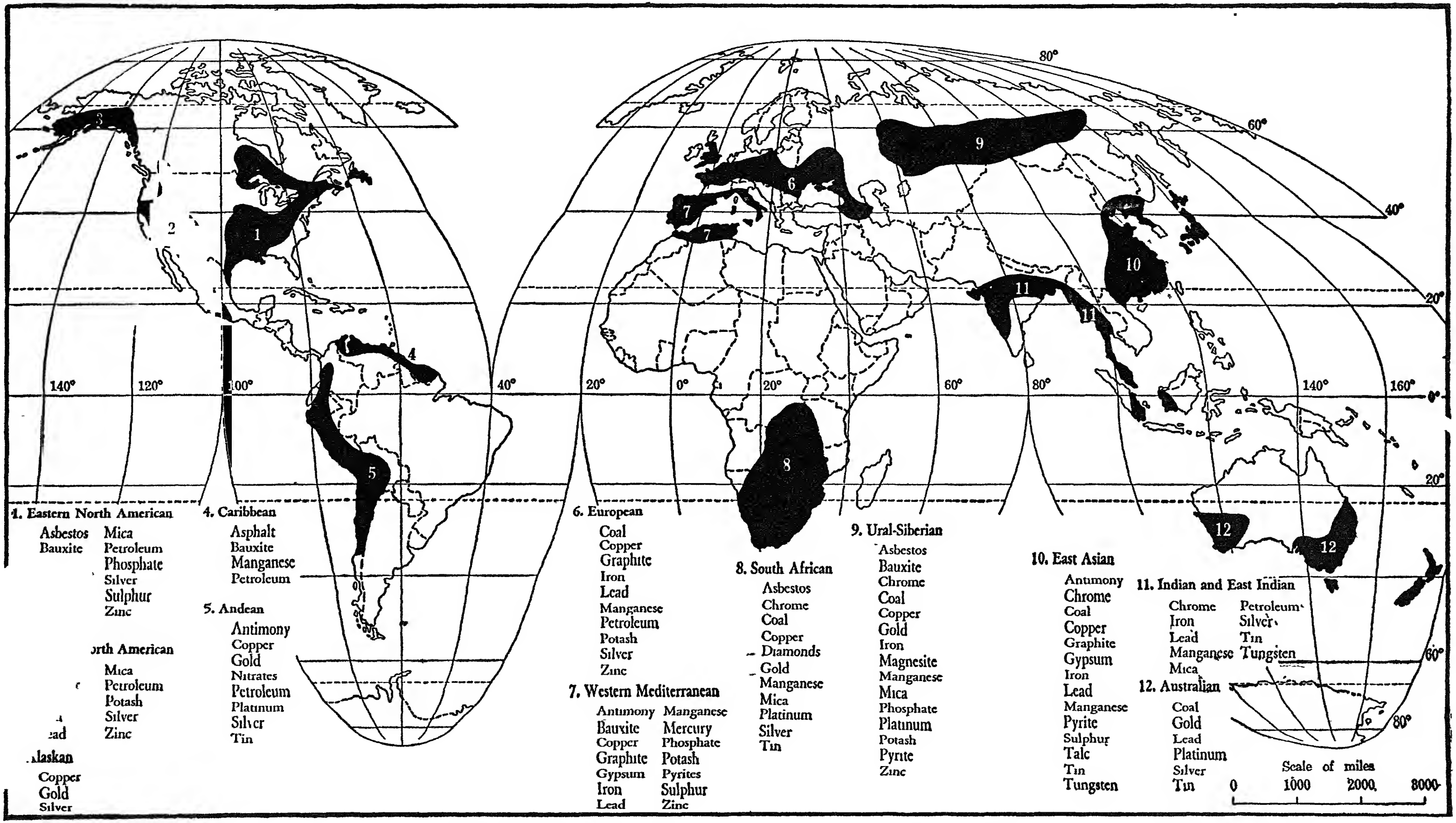

FIG. 27. The major mineral-producing areas of the world

back to the plant and animal life of earlier geological ages. Coal and petroleum were formed where accumulations of organic material, as on the floor of a shallow sea, were buried deeply by mud or sand. Gradually, through long periods of time, as the mud changed to shale or the sand changed to sandstone, the plant or animal matter changed to coal or petroleum. Stored in sedimentary rocks, therefore, and thus relatively near the surface, are beds of coal, petroleum, and other minerals, each of distinctive use to mankind.

Mineral-Producing Areas. Minerals are used for local needs in most or all inhabited parts of the world. Rock walls, adobe huts, the cooking utensils of some primitive tribes, and graveled paths and roadways are examples of early uses of minerals. In modern times, however, coal, iron, and other mineral products are used in great quantities, and it is fortunate that at least some areas possess huge deposits. In fact, large deposits that can be worked cheaply form the basis of the great mineral industries of today.

The areas shown in Figure 27 contain the great mining districts. They appear in every continent and very nearly surround the Pacific. South Africa and South America contain districts of world significance, but two areas—the European and the Eastern North American—lead in both present and past importance. This is largely because they both produce and consume great quantities of such basic things as coal and iron, the very foundation of modern civilization.

The United States and the Soviet Union include within their borders a greater variety and a greater quantity of minerals than other nations. The British Empire can about match them, but in widely separated areas. Even these nations, however, are deficient in some important minerals. This deficiency results in one of three practices: trade with countries that have the desired minerals, the use of substitutes, or going without. The first two represent the part of wisdom.

QUESTIONS

1. Name a city in the United States from which a person might write: "I like the summers here. It never rains and it never gets very hot."

2. Is it true that dry weather and dust storms in January and hot rainy days in June are characteristics of India (p. 620)?

3. "In London we found it delightfully cool, but our friends wrote that at the same time in Moscow it was frightfully hot." To what season of the year do these statements refer?

4. "In our trip up the Amazon we experienced the same kind of weather day after day, but as we traveled up the Mississippi from New Orleans to St. Paul we experienced all sorts of weather." Could this be true?

5. What is meant by "a mountain barrier"?

6. Why are high mountains significant in arid regions?

7. Are all plains lowlands? Are all lowlands level?

8. Why do ten of the fifteen largest rivers of the world empty into the Atlantic and Arctic oceans (pp. 22 and 28 and Fig. 15)?

9. How many of these fifteen river systems probably are blocked with ice in their lower courses in winter?

10. What is the effect of the Great Lakes on the flow of the St. Lawrence?

11. Which river is navigable throughout a greater proportion of its length, the Amazon or the Ganges?

12. Why is the soil called an "independent natural body"?

13. Define (1) bedrock, (2) mantle rock, (3) soil, and (4) subsoil.

14. What is humus? From what is it derived?

15. What is a soil profile?

16. How do plants get their food? What soil conditions help plants to get their food?

17. What is the significance of soil bacteria?

18. On what conditions does soil productivity depend?

19. What is the relation of soil to vegetation?

20. Why are the soils of the areas which were originally covered with temperate hardwoods in Europe and in the United States called "the soils of Western civilization"?

21. What useful mineral materials are derived from mantle rock?

22. What is meant by "a rock outcrop"?

23. What is meant by an "ore deposit"?

24. What is the function of the smelting and refining industries?

25. Compare the Northern and Southern hemispheres as to number of mineral-producing areas.

EXERCISES

1. *Climatic divisions*

Arrange in table form the climatic divisions of the world shown in Figure 14, using the following as a model. At the right of the name of each climatic division write the names of three areas which illustrate that division. Take the areas from the list printed below the table.

Climatic Divisions	Illustrative Areas
Humid Tropics	*Congo Basin, __?__, __?__*

Congo Basin	India	Amazon Basin
Rocky Mountains	Uruguay	Tibet
Cuba	Java	Northern Australia
Sahara	Arabia	Eastern China
South Carolina	Portugal	Northern Norway
Northern Alaska	Eastern Germany	Central Argentina
Eastern Colorado	Greenland	Hungary
Illinois	Central Spain	Central Chile
California	Alps	Union of South Africa

2. *Surface features*

Locate by number on an outline map of the world the following areas. Prepare a legend which for each area will show the number, the name, and the type of surface feature. Follow the sample given below the list of areas. In locating the areas consult the Index, the maps at the back of the book, and Figures 15 and 20.

1. Appalachian Highland
2. Rocky Mountains
3. Sierra Nevada
4. Great Basin of Nevada and Utah
5. Basin of the Mackenzie River
6. Cascade Range
7. Andes
8. Amazon Basin
9. Brazilian Plateau
10. Basin of the Paraná River
11. Abyssinia
12. Most of the Congo Basin
13. Atlas Mountains
14. Balkans
15. Alps
16. Po Valley
17. Apennines
18. Hungary
19. Carpathians and the basin of the Volga River
20. Ural Mountains
21. Scotch Highlands
22. Himalaya Mountains
23. Tibet
24. Arabia
25. Lower basin of the Indus River

Sample Legend
1. Appalachian Highland, hilly region

3. *Water resources*

Assign each of the following rivers or groups of rivers to one of the indicated use groups.

The Rivers	The Groups
Niagara, Hudson, Nile, Lower Rhine, Upper Rhine, Amazon, St. Lawrence, Thames, Lower Mississippi, rivers of Western United States in general	Group 1. Much used for navigation Group 2. Much used for power Group 3. Much used for irrigation

4. *Soil and vegetation*

a. Make a drawing to illustrate the relation of bedrock to mantle rock.

b. Write a definition of (1) gravel, (2) sand, (3) silt, (4) clay.

c. Explain in writing why, in general, grassland soils are more fertile than forest soils.

5. *Minerals*

Write a brief statement describing the distribution of the major mineralized areas of each continent.

CHAPTER III

TRADE AND TRANSPORTATION CONNECT REGIONS

Commodities Originate in Many Regions. When in the crisp days of autumn a football team takes the field to represent a school or college, it also represents a vast group of workers invisible to the people in the stands. In a way this vast invisible group, like the spirit of the rooters, really contributes to the performance of the team. In fact, the contribution of the invisible multitude is essential to the game; for their toil and skill produced the special clothing and equipment worn and used by the team.

First and most important is the football kicked off by the practiced toe of a member of the team. The cowhide cover of this ball may have come from a factory in Philadelphia, and the rubber for the bladder probably was made in Akron from rubber grown in far-off Sumatra. The suits, jerseys, shoes, and helmets likewise represent the output of men in many widely scattered industries. The jerseys, brilliant with the colors of the school, were knitted, perhaps, in a New England factory, from wool grown in Australia, and were dyed in New Jersey with dyes prepared by a world-famous chemical concern. The shoes may well have been made in a New Jersey factory out of leather tanned from Texas hides with quebracho extract from the Argentine. These and many other examples which will occur to you show that it requires the labor and skill of many people to produce the raw materials even for the equipment of the team, to say nothing of the clothing of the people in the stands. In addition, it takes many hands and many machines to turn out the finished products.

When once the game is over, players and spectators, with appetites quickened by the brisk November air, repair to home, club, or restaurant for the evening meal. That food is available for all of them is a tribute to the business organization of the communities in which we live and to similar organizations spread widely over the world.

How Commodities Are Made Available. If we look beyond the home or restaurant, or if we endeavor to trace the origin of our clothing, we come first to the shops and stores of our community. In these shops, goods of great variety are displayed for our selection. Here commerce comes so close to our homes that we have personal

contact with it. Stores, shops, or trading posts of some sort are maintained in nearly every inhabited land; and if it were possible to plot them all on a map, the map would show the extent of the Commercial World.

Where do our stores and shops get the goods they sell? The grocer, for example, buys his meat from an agent of a great meat-packing concern, his fruit and vegetables from a commission merchant, and his sugar, flour, and canned goods from a wholesale house. In the clothing, dry-goods, and other lines of trade, retailers buy from agents, wholesalers, jobbers, or, in some cases, direct from manufacturers. The agents, wholesalers, and jobbers are known as middlemen. They are located in railroad centers so that they can deliver goods promptly to a large surrounding area and can receive a steady supply of goods from mills, workshops, and factories in our own and other countries. In much the same way our hardware, drug, and other stores maintain a working connection with the Commercial World.

The Magic Wand of Trade. The Commercial World includes all the areas where there are definitely established agencies for buying and selling. These agencies are of great variety and number, but essentially their function is to assemble and distribute commodities. They range in size and dignity from an individual fur-trader bargaining for pelts on the Siberian frontier to a famous London firm with agencies in all important world ports and with three centuries of tradition behind it. In carrying on trade these organizations utilize steamships, railroads, trucks, pack trains, and other means of transportation. The combination of trading agencies and transportation facilities is the means by which trade is carried on within a region or between regions. It is the magic wand which waves the products of all climes to our doors and which carries to consumers in many regions the products of our occupations.

Domestic and Foreign Trade. Trade wholly within a country is called domestic trade; that between people in different countries is known as foreign trade, or commerce. Thus, when a firm in San Antonio, Texas, buys an order of shoes from a shoe manufacturer in St. Louis, the transaction is part of our domestic trade; but when subsequently the San Antonio firm sells part of the shoes to a merchant in Monterrey, Mexico, that transaction becomes a part of our foreign trade. Our domestic trade is much larger than our foreign trade, but our government does not keep a complete record of it. Our

foreign trade passes through relatively few ports and border towns, and at those points our customhouses keep a record both of incoming goods (imports) and of outgoing goods (exports).

Transportation, the Bridge between Regions. The great structure of modern transportation is an essential feature of the Commercial World. Steamships ply the oceans to carry on trade between the continents; and within the continents, railroads and highways bring goods to us and take our products to market. Airplanes carry mail, express, and passengers long distances in a surprisingly short time and are doing much to bring people into closer contact. The telephone, telegraph, and radio now are essential features of our daily life, and business and industry could not go forward effectively without them. These agencies of transportation and communication have opened new lands to settlement, have created new markets, and have brought us new foods. They make it possible for us to visit other countries and to know of distant peoples. Their function is to bridge distance and save time, most important matters in a world as large as ours.

Ocean transportation. The oceans are the highways connecting the regions of the world, and ships are the vehicles in which people and commodities move over these highways. Except in the channels leading to our ports, the sea lanes cost nothing to maintain. As a result, goods are moved long distances by sea at low cost. The modern cargo ship (Fig. 13) carries as much as five freight trains of forty cars each and, with its great engines, can make a voyage in scheduled time in spite of head winds or currents. Sea transportation, therefore, has become reliable, safe, and cheap—three essentials of modern transport.

As might be expected, the principal sea lanes connect the four densely peopled regions (Figs. 1 and 28). The busiest lane of all is the North Atlantic Route, connecting Eastern United States and Canada with Western Europe. This lane and its branches carry nearly half the shipping of the world. The sea lane second in importance is the route leading from Western Europe via the Mediterranean and Suez to India, Eastern Asia, and Australia. Ships from Eastern United States to India also use this route. The east coast of South America is reached by shipping from both Western Europe and the United States, and the trade of the west coast reaches North Atlantic points by way of the Panama Canal. A lane in which the United

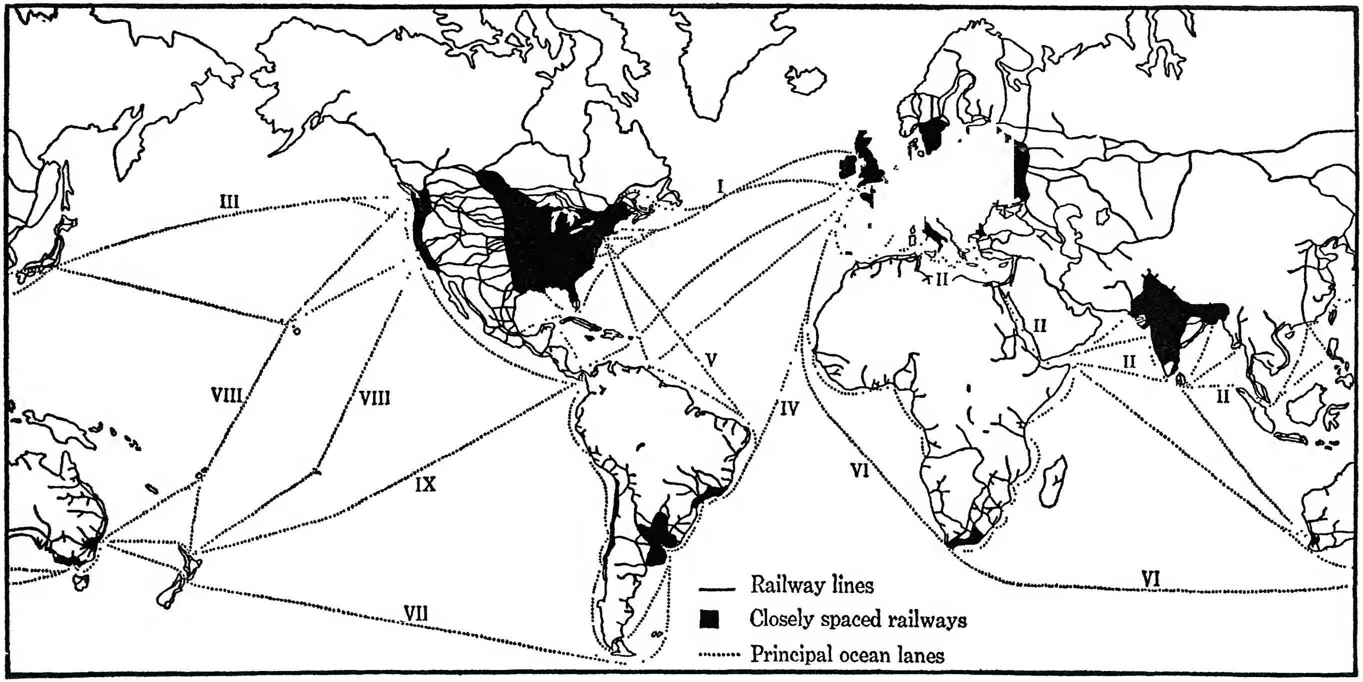

Fig. 28. Distribution of railway transportation and the principal ocean routes (method of showing railways after Mark Jefferson). I, North Atlantic Route; II, Suez Route; III, North Pacific Route; IV, Europe–South America Route; V, North America–South America Route; VI, Good Hope Route; VII, South Pacific Route; VIII, North America–Australia Route; IX, New Zealand–North Atlantic Route

States has great interest is the North Pacific Route, connecting the United States and Canada with Japan, China, and the Philippines. The Panama Canal gives Eastern United States access to this route.

Land transportation. Railroads and roads are the principal means of transportation on land. Lakes, rivers, and canals, however, may be classed under land transportation, for they connect places within the continents. In some parts of the world the only highways are trails over which goods are carried on the backs of animals. For long-distance shipments by land, railroads are our most important carriers. One accustomed to the closely meshed railway pattern in the United States can hardly realize that large sections of the world are without railway transportation (Fig. 28). For short distances the modern road and the motor vehicle have come to be the most efficient means of transportation.

Air transportation. Air transportation introduces a new factor in the Commercial World: it serves to illustrate the ever-changing conditions of industry and trade. Air lanes connect most of the European capitals, and are used regularly. Regular services extend also to India and on to French Indo-China and Java. In the United States our major cities are now connected by air routes, and regular services are maintained to both the east and the west coast of South America. One of the most thrilling chapters of transportation history was the opening of the service by the famous Clipper ships from the United States across the Pacific Ocean to the Philippines and China. More recently regular air service by Clipper ships was established across the North Atlantic. An important function of the airplane has been demonstrated in Canada, where men and supplies are carried in a few hours to mining camps in the northern wilderness; otherwise such camps are reached after three or four weeks' travel by trail and canoe. In this way the commercial frontier is advancing into the great wildernesses.

QUESTIONS

1. What is meant by (1) domestic trade and (2) foreign trade?

2. In what four ways has modern transportation been of service to mankind?

3. Why is ocean transport cheap?

4. What interest has (1) the west coast of South America, (2) New Zealand, and (3) California in the Panama Canal?

5. What are the two leading ocean routes? Why?

6. Which of the ocean routes reach the United States? Which do not?

7. Which type of land transport is most efficient in moving heavy goods over long distances? Why?

8. In what type of transport is the motor vehicle highly efficient?

9. What has the airplane meant to exploration? Name areas where this holds true.

EXERCISES

1. *Types of trade and trading agencies*

What is the function of (1) a retailer, (2) a wholesaler, (3) a commission man, (4) an importer, and (5) an exporter? Which of these types of agencies are present in the community where you live? Name firms which illustrate each type present. How far should you have to go to find examples of the types not present in your community? Answer in writing.

2. *Ports and ocean routes*

Name and locate a port at each end of each principal ocean route. (Consult the atlas section of this book.)

3. *Railway transportation*

Where are (1) the principal railway areas in each continent and (2) the principal areas without railway transportation? (Consult Figure 28 and the atlas section of this book.)

CHAPTER IV

COMMERCIAL REGIONS

Major Regions. In the Commercial World two areas, the United States and the Heart of Western Europe, stand out like giants in the midst of a crowd of pygmies (Fig. 29). There the fishing, lumbering, mining, and agricultural industries attain their maximum development. In addition, these are the only areas where manufacturing is done on a large scale. The volume and value of the trade between these two areas and between them and other parts of the world make them, in effect, the hubs of commerce. From all productive parts of the world, foods and raw materials move to the United States and Western Europe, and from them goods in great variety and quantity are widely distributed. Their huge commerce is due in large measure to the skillful utilization of their rich natural resources.

Regions of Second Rank. Canada, India, Japan, Argentina, and Australia make up the second group of commercial areas. Canada, Argentina, and Australia are young countries, and we may expect their industries and trade to expand. India and Japan, however, are old. Their large trade reflects their teeming populations and their broad areas of productive land. Their markets are eagerly sought by exporters in Western Europe and the United States. In return, India and Eastern Asia sell such distinctive goods as silk, tea, jute, and spices, as well as many other commodities. Japan is a crowded country with a low standard of living and a recent active interest in manufacturing and commerce.

Regions of Third Rank. Several widely separated areas make up the third group of commercial regions. The New World is represented by (1) the Caribbean countries, especially Mexico and Cuba; (2) Brazil, which means Eastern Brazil, for the interior sections produce little; and (3) the West Coast of South America. In Europe the Scandinavian countries and Eastern Europe add two regions to the list. Africa also adds two areas, with South Africa at the south and the Mediterranean border at the north. China, with the Philippines and the East Indian region (including the East Indies and British Malaya), complete the list. Each of these areas has tracts of level fertile land, and each produces large quantities of goods for export. Each of them buys heavily from other regions, especially from Western Europe and Eastern United States.

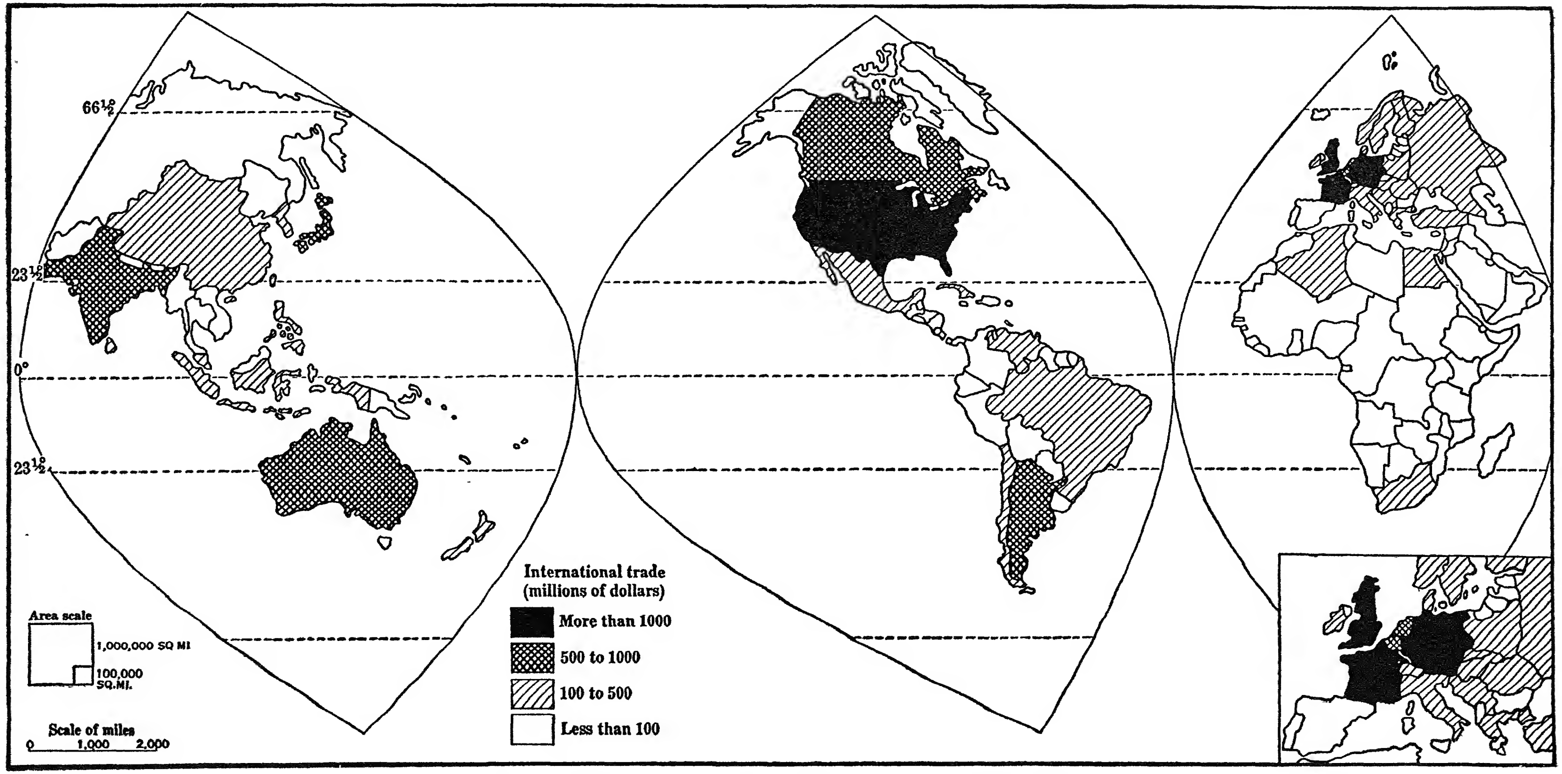

FIG. 29. Foreign commerce of the countries of the world

The Commercial Frontier. The areas left blank in Figure 29 have relatively little commerce. Uruguay and a few others have considerable trade; but since they are small countries, the total does not place them in the third group. The Amazon Basin, Siberia, and Central Africa possess natural resources which as yet have not been developed. These areas, therefore, are the question marks of the commercial future. Other areas, notably Tibet (high), Central Australia (arid), and Greenland (ice-covered), are so poorly equipped for human occupation that they offer but little to commerce.

Commercial Leadership of the Northern Hemisphere. Most of the important commercial regions lie in the Northern Hemisphere. In fact, the Southern Hemisphere has no commercial region of first rank and only two of second rank. This fact brings out a highly important phase of world geography. Most of the people, most of the industries, and most of the broad, level, fertile plains of middle latitudes are in the Northern Hemisphere. The northern continents are broad in middle latitudes and narrow as they approach the equator. The southern continents, in contrast, are broad in low latitudes, but their middle-latitude area is small.

The Role of the United States. In characterizing the commercial development of the United States an eminent foreign geographer said: "You are a 60 per cent country; it seems to me you have about 60 per cent of everything. Be it corn or cotton, coal or iron, petroleum or copper, the United States produces a notable fraction of the world's output." In the case of the items he named and also of a goodly list of other commodities his statement holds true. Of many of these commodities, not only do we supply our own demands but we also export large quantities to other countries (Fig. 30). For many important commodities, however, the United States depends wholly or in part on other countries. Most of the leading items in our import trade reflect some condition of land, climate, or other resource possessed by the region of production and not possessed (in sufficient abundance at least) by the United States.

Major Regions with Which the United States Trades. The United States has some trade with most sections of the Commercial World (Figs. 31 and 32). Many countries, for example, look to this country for petroleum products, automobiles, agricultural machinery, leather, and a considerable variety of other goods. Our ever-increasing interest in manufacturing leads us to import raw materials from many

Exports	Value	Imports	Value
Cotton (raw)	$391,000,000	Paper and manufactures, and materials for making paper	$164,000,000
Machinery	265,000,000	Coffee	137,000,000
Petroleum and products . .	250,000,000	Sugar (cane) . . .	134,000,000
Automobiles and parts .	227,000,000	Rubber (crude)	119,000,000
Tobacco (raw)	134,000,000	Silk (raw)	96,000,000
Chemicals	103,000,000	Vegetable table oils . . .	79,000,000
Fruits and nuts . . .	94,000,000	Tin	70,000,000
Iron and steel mill products	88,000,000	Fruits and nuts	55,000,000
Coal and coke	52,000,000	Furs and manufactures . .	53,000,000
Copper, including ore and manufactures	49,000,000	Hides and skins	46,000,000
Packing-house products . .	42,000,000	Petroleum and products . .	37,000,000
Sawmill products	41,000,000	Burlaps	33,000,000
Cotton manufactures . . .	39,000,000	Copper, including ore and manufactures	33,000,000
Wheat and flour	15,000,000	Wool and mohair	30,000,000
		Fertilizers and materials . .	29,000,000
		Tobacco (raw)	26,000,000
		Wool manufactures . . .	20,000,000

FIG. 30. Leading exports and imports of the United States for a representative year. The United States is divided into forty-eight customs districts under the jurisdiction of the Treasury Department, and records of our foreign trade are kept at the ports of entry in each of these districts. Each year the Department of Commerce publishes a record of our imports and exports in a volume called *Foreign Commerce and Navigation of the United States.* This department also publishes the *Foreign Commerce Yearbook*—a useful survey of commercial conditions in all countries

places, and thus the United States is an important market for many a distant farm or plantation. In both volume and value, however, most of our foreign trade is with four great areas.

Our trade with Canada. Our total trade with Canada exceeds our trade with any other country. Canada is the leading source of our imports and ranks next to the United Kingdom as a purchaser of our exports. Among our important sales to the Canadians are great quantities of coal and manufactured goods; and from them we draw much of our newsprint paper, most of our asbestos and nickel, and large quantities of other goods. Our trade with Canada is much like our domestic trade.

Trade with our tropical neighbors. With the rich region facing the Gulf of Mexico and the Caribbean Sea, as well as with Brazil, the United States carries on an ever-increasing trade. These areas possess, in their tropical climate, a natural condition not duplicated in the

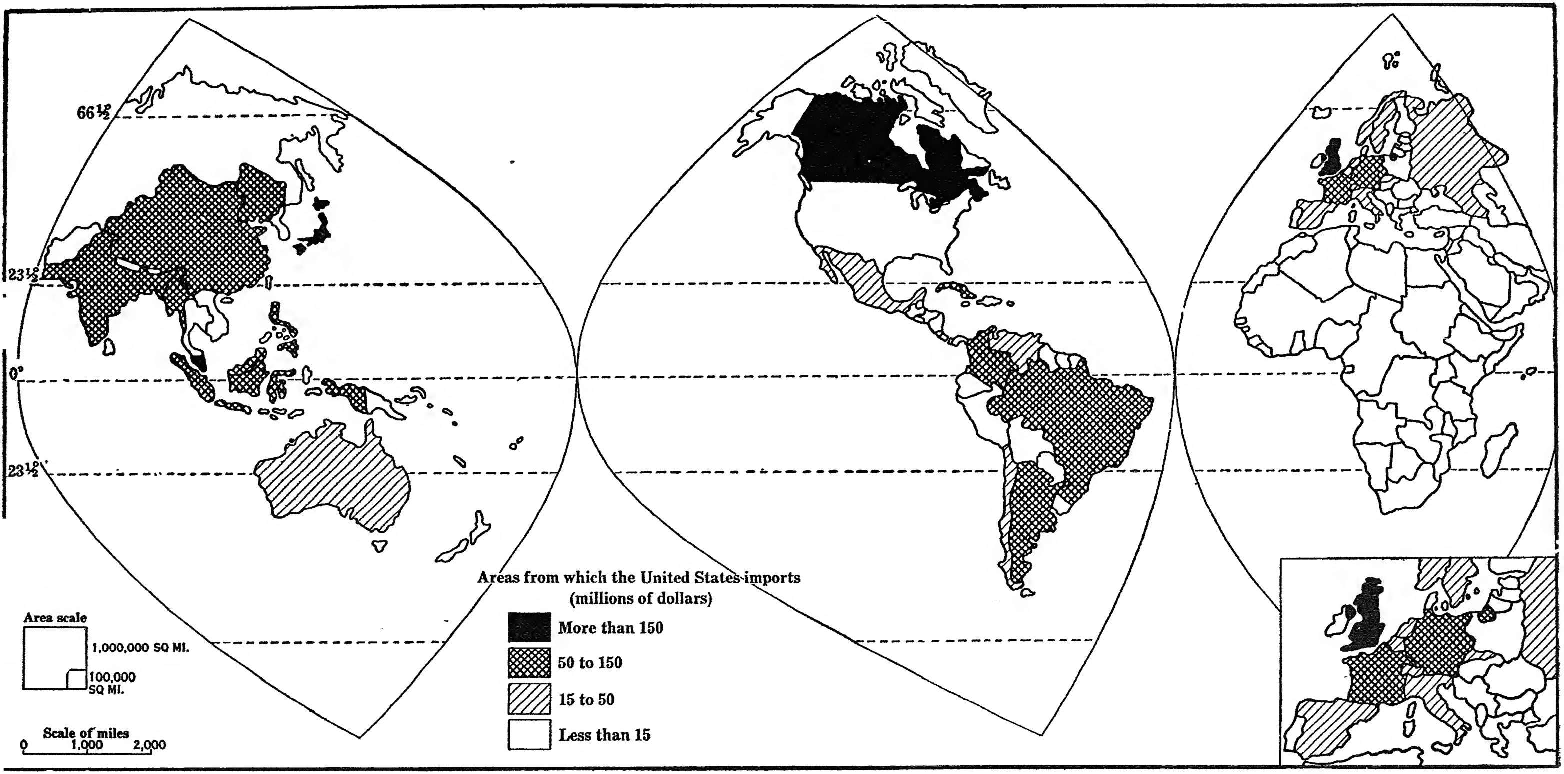

Fig. 31. The import trade of the United States

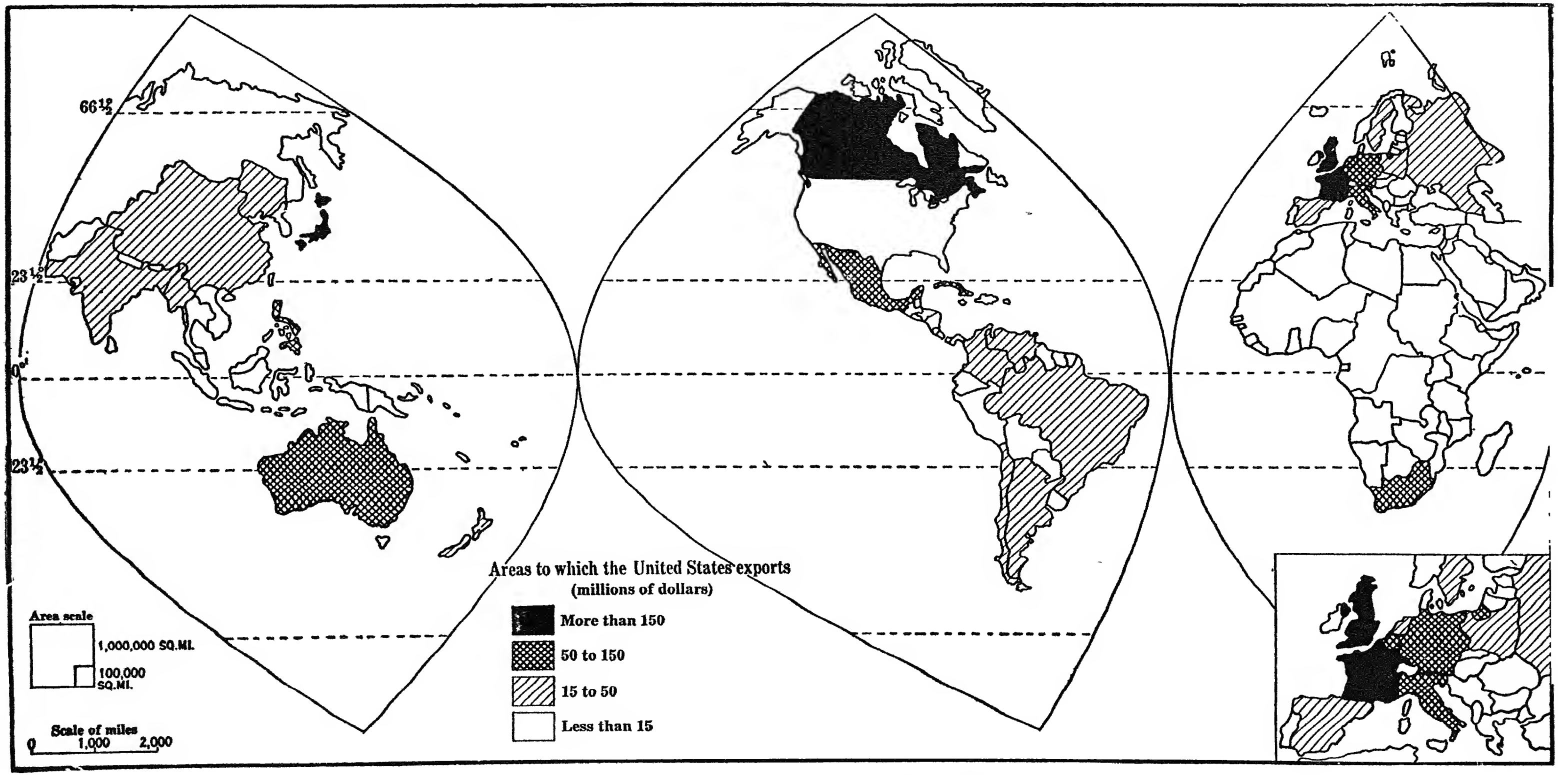

FIG. 32. The export trade of the United States

United States, and we draw upon them for many tropical products—coffee, sugar, and fruits and nuts, for example (Fig. 30). In turn we send them commodities which reflect our distinctive industries and resources.

Trade with the Orient. In the Orient our trade is with three regions: Eastern Asia (Japan, China, and the Philippine Islands), Southeastern Asia (the East Indies and the neighboring peninsulas), and Southern Asia (India and Ceylon). Our largest trade is with Japan, and Japan is the only one of the Oriental countries which commonly buys from us more than we buy from it. However, the trade of the Philippines is mainly with the United States. From Southeastern Asia we buy much rubber and tin, but to that area we sell very little. Its imports come largely from Great Britain, France, and the Netherlands, the mother countries, and from Japan. With India our trade is somewhat better balanced, but our imports are always greater than our exports.

Trade with Western Europe. In many respects the most important division of our foreign trade is our time-honored trade with the United Kingdom and other countries of Western Europe. Our exports to Western Europe reflect the need of those old and densely peopled countries for the foods and raw materials of a young and rich country like the United States. Our imports, in their turn, reflect our large demand for textiles, chemicals, and other lines in which Western Europe long has maintained leadership.

The United States Well Placed for Trade. The United States is exceptionally well placed to trade with other important areas of the Commercial World. The United States and Canada alone, of all the major countries of the world, front on both the Atlantic Ocean and the Pacific Ocean (Plate X). This interocean position gives us the advantage of the North Atlantic Route to densely peopled Western Europe and of the North Pacific Route to the densely peopled regions of the Orient. In 1914 we opened the Panama Canal and thus connected these two great ocean highways. Both our east coast and our west coast are now connected with Europe on the one hand and with Eastern Asia on the other. We also are well placed to trade with the other countries of the New World, especially since the Panama Canal opened a direct water route from Eastern United States to the West Coast of South America, with its wealth of copper ore and other valuable minerals.

QUESTIONS

1. Someone has said, "The denser the population, the greater the commercial importance of a country." Does this apply to Great Britain as compared with Norway? Does it apply to China as compared with the United States? What conclusion may we draw about the value of such generalizations?

2. Which parts of the world are of most importance in (1) our import trade (Fig. 31) and (2) our export trade (Fig. 32)?

3. Name three countries which make large use of American goods; three which make but little use of American goods.

4. Over which trade route (Fig. 28) would an American exporter ship goods to be sold in (1) Germany, (2) Brazil, (3) India, (4) Japan, (5) New Zealand, and (6) South Africa?

5. From what two countries do we buy much more than we sell to them? Of what two countries is the opposite true?

6. What is remarkable about the position of the United States in relation to the oceans?

EXERCISES

1. *Commercial regions*

Make a statement in writing about the commercial importance of (1) the lands bordering the North Atlantic and (2) the lands in the Northern Hemisphere as compared with those in the Southern Hemisphere.

2. *Graphic presentation of our foreign trade (Fig. 30)*

Prepare a bar graph showing the leading exports of the United States by value and a similar graph for our leading imports. Arrange the commodities in order of importance in a left-hand column and let each half-inch of your scale represent 25 million dollars.

3. *Landscape indications of our trade*

Each of the following illustrations—Figure 6, Figure 8, Figure 9, Figure 12—suggests some commodity that is important in the foreign trade of the United States.

List these figure numbers in the first column of a table, with the title given above. In the second column write the name of the commodity suggested. In the third column tell whether the commodity appears in the export list or the import list of Figure 30.

2

TROPICAL AMERICA

CHAPTER V

COMMERCIAL RELATIONS OF THE UNITED STATES WITH TROPICAL AMERICA

Distance Favors United States Trade with Tropical Lands. The United States is better placed than any other important country for trade with tropical countries. Cuba lies but seven hours by water from the southern tip of Florida, and the other West Indian and Caribbean countries lie within a few days' sail. As a result we can receive tropical products and deliver goods to the tropics quickly and cheaply. With the advent of regular air services, we are even closer in time to the major West Indian and Caribbean points. How differently the United Kingdom and other European countries are placed with regard to tropical trade! Northern Africa is the nearest low-latitude area (Fig. 14), but most of it is desert. In fact, the nearest humid tropical lands lie thousands of miles from Europe, and this means many days' sail. In trade with the tropics, therefore, the handicap of time and distance is in favor of the United States and against Europe.

Extent of Tropical America. From the standpoint of climate Tropical America means only those areas where there is no frost and where plants grow the year round if there is moisture enough. In such lands people dress in cotton or other cool clothing and build houses to give protection from heat and rain rather than from cold. These conditions exist only on the lowlands (Figs. 14, 33, and Plate IV). In the highland areas cool weather occurs, and there are even occasional frosts in the cooler months. These uplands and lowlands, therefore, constitute two rather distinct types of environment; but in common practice we use the term Tropical America to mean the countries which are truly tropical in their lowland sections, and for convenience we include the highland sections as well. Defined in this way, Tropical, or low-latitude, America includes all of America south of the United States and north of Uruguay and Argentina. It lies approximately between 25 degrees north latitude and 25 degrees south latitude.

Divisions of Tropical America. Commercially, Tropical, or low-latitude, America consists of two major divisions, the Gulf and Caribbean Lands and Tropical South America (Fig. 34). In European commercial circles the Gulf and Caribbean Lands frequently

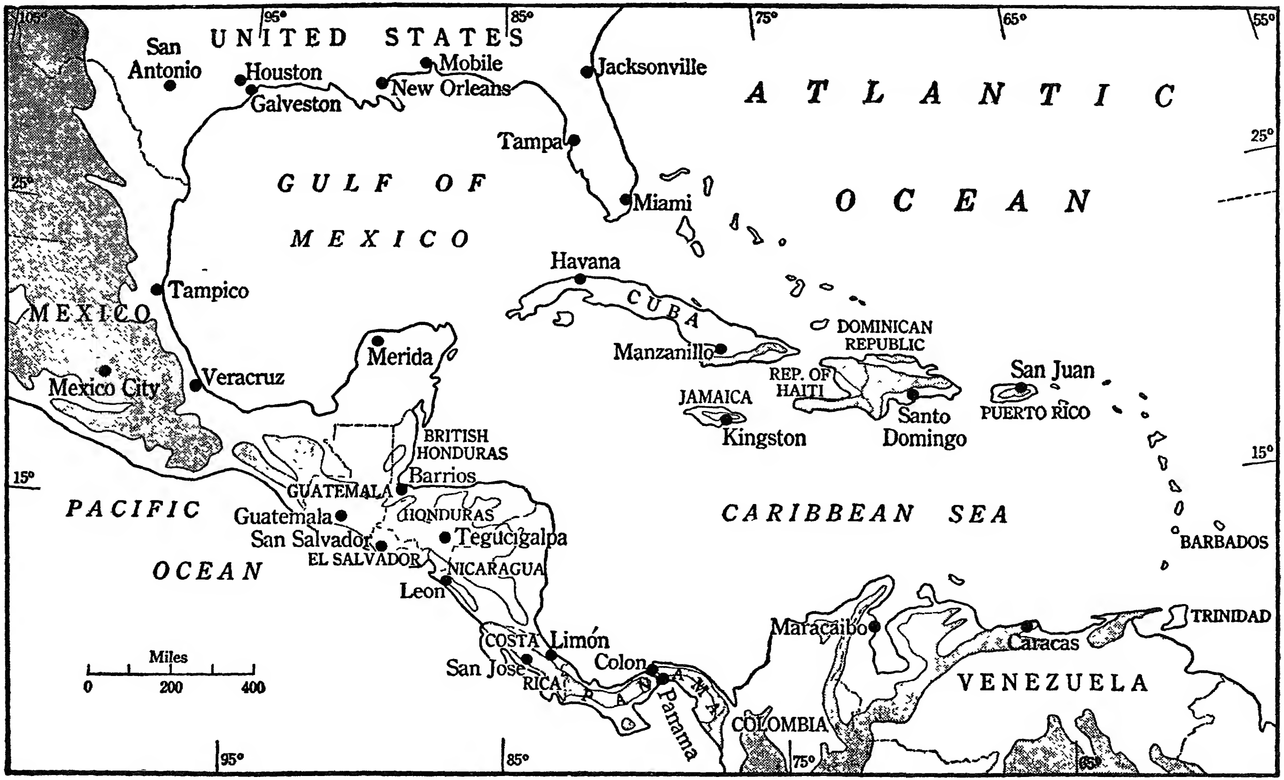

FIG. 33. Gulf and Caribbean Lands. Shaded areas are highlands; the land areas left blank are lowlands

Tropical South America	Gulf and Caribbean Lands (Middle America)	
Brazil	Mexico	West Indian countries
Colombia (southern section)	Central American countries	Cuba
Ecuador	Guatemala	Republic of Haiti
Peru	British Honduras	Dominican Republic
Bolivia	Honduras	Puerto Rico (U.S.A.)
	El Salvador	Virgin Islands (U.S.A.)
	Nicaragua	British West Indies
	Costa Rica	Jamaica
	Panama	Trinidad
	Colombia (northern section)	Other small islands
	Venezuela	French West Indies
	British, French, and Dutch Guiana	Netherlands West Indies

FIG. 34. Countries of Tropical America

are called Middle America to distinguish the area from continental North America and South America. The Gulf and Caribbean Lands contrast sharply with Tropical South America in their physical make-up (Fig. 33 and Plate IV). The former consists of irregularly shaped peninsulas, isthmuses, and islands bordering the Gulf of Mexico and the Caribbean Sea, and most points lie relatively near the sea. The latter is a great continental land mass, some parts of which lie a thousand miles or more from the sea. As might be expected from their peninsula-island pattern, the Gulf and Caribbean Lands display a series of detached commercial areas.

What We Buy from Middle America. The United States is the principal market for most of the commodities exported from Middle American countries. High in the list stand sugar, which we get from the West Indies; and bananas and cacao, which come from the hot rainy lowlands encircling the western end of the Caribbean Sea. From the luxuriant forests of these same lowlands we get considerable quantities of mahogany, chicle, and dyewoods. The neighboring uplands, moreover, ship large quantities of high-grade coffee both to the United States and to Europe. Since no part of the United States has a tropical climate, we look to the tropics for these important products. As the Middle American countries are the tropical areas nearest to us, we buy more from them than from more distant tropical regions.

The United States also imports large quantities of minerals from Middle America, particularly from Mexico. Mexico mines gold and more silver than any other country in the world. In many cases the

minerals produced in Middle America are shipped to our ports to be smelted or refined. Crude petroleum, for example, moves from Mexican and Venezuelan oil fields to our ports, while copper from the highlands of Mexico is brought to plants in our cities to be refined. Some of the refined products may be shipped back to Middle America for use there or else exported to Europe. Asphalt from Trinidad, bauxite (aluminum ore) from British and Dutch Guiana, and iron ore from Cuba are other minerals which we import from the Gulf and Caribbean countries.

What Middle America Buys from Us. Most of the Gulf and Caribbean countries buy more from the United States than from any other country. We are their best customer, and they are one of our large markets. Many areas in Tropical America specialize in the production of a single commodity, and they depend to a large extent upon the outside world for the things which they themselves use. Many of these things are produced on the farms and in the factories of middle-latitude countries. Since the United States is the nearest middle-latitude country, they find it convenient to buy from us.

Cotton for people in the warm, humid lowlands. In the Gulf and Caribbean Lands, as in other tropical regions, cotton cloth and cotton wares rank among the leading imports. The weather is warm and humid, and the mass of the people are poor. Consequently there is a large demand for cool, cheap, and durable clothing. Considerable quantities of cotton cloth are manufactured in Mexico, but even that country imports cotton products. The Gulf and Caribbean countries, like other tropical countries, long have imported cotton goods from Great Britain, but in recent years they have bought also from the United States and from Japan.

Materials for construction. The Gulf and Caribbean countries import a wide variety of materials for construction purposes from the United States and Western Europe. This trade furnishes further evidence that tropical areas depend on middle-latitude mills and factories. Many of the homes and smaller buildings are built from local stone or brick. For larger buildings, iron and steel, cement, copper goods, and other materials are imported. In the more humid sections wood and ordinary iron and steel deteriorate rapidly. Consequently, large quantities of galvanized iron (sheets of iron coated with zinc to keep them from rusting) are imported for roofs and even for walls of cheap or temporary buildings. The rapid develop-

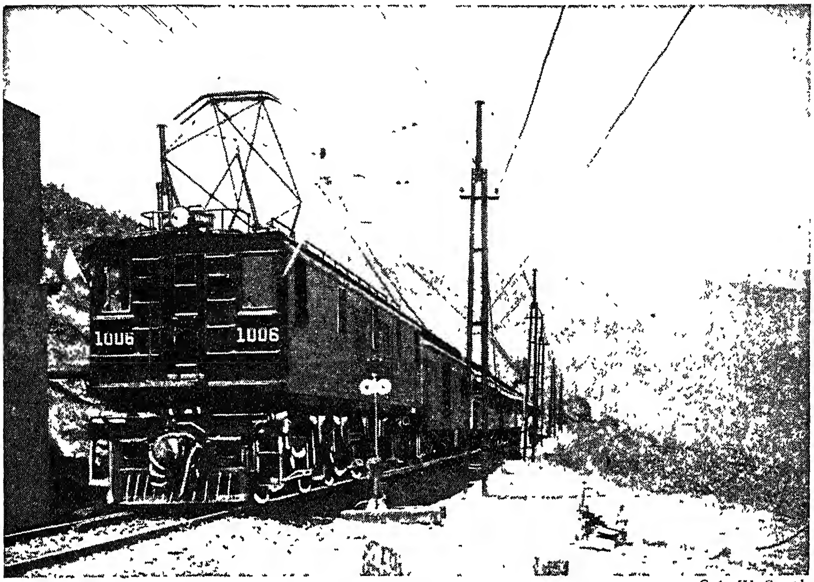

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FIG. 35. The Mexican Railroad leading from Veracruz to the city of Mexico. The power is developed from a stream rising on the snow-capped mountain

ment of the oil districts in Colombia and Venezuela, the construction of modern port facilities, and the extension of telegraph, telephone, and lighting systems all call for imported materials.

Equipment for transportation and communication. The need for transportation and communication leads to large importations into Middle America. The countries of this region buy radio, telephone, and telegraph apparatus from the United States, they buy American automobiles and trucks in increasing numbers, and airplane services call for the import of aircraft and parts. In the larger countries, especially in Mexico and Cuba, railroads extend from the principal ports to points in the interior. These railroads are vital to the business of the country; for they bring to the ports the products of the plantations, mines, and forests, and they carry to inland cities the goods brought from other countries. The building and upkeep of railroads give rise to considerable trade with middle-latitude countries; for the steel rails, locomotives, and rolling stock for Middle American railroads come largely from the United States or Great Britain (Fig. 35).

Machinery for tropical industries. In tropical countries, as elsewhere, some industries require the use of machinery. Plows, tractors,

and other machines are used in cultivating the land. Rather expensive machinery is required in preparing some tropical crops for market. In the mining districts large quantities of machinery are needed. The oil wells of Mexico, Venezuela, and Colombia, for example, create a large demand for well-drilling machinery and pumps. The mines require engines and dynamos; fans for ventilation; pumps to keep the mines free from water; hoists and cages to lift ore out of the mines; and crushers to prepare the ore for smelting. The orders growing out of such demands for machinery and equipment help to keep many a middle-latitude factory busy.

Equipment for maintaining health. Periodic outbreaks of fever in tropical ports long since directed attention to the perils which threaten health in tropical countries. In fact, people thought until recently that a high death rate was inevitable in such warm, humid climates. The problem gained much attention because of the high death rate which characterized the attempt of French engineers to dig a canal across the Isthmus of Panama (1881–1889). The construction of the Panama Canal (1907–1914) by the United States, however, demonstrated that men can be as healthy in the tropics as elsewhere, provided they fully safeguard their food and water, maintain adequate sewerage systems, and rid their locality of fever-carrying mosquitoes. Such sanitary measures require the importation from the United States or Europe of rather large quantities of iron pipe, tile, boilers, engines, machinery, and chemicals. In addition, modern hospitals are maintained; and for them, as well as for the general public, drugs and hospital supplies are imported. These come principally from American and European laboratories.

Fuel for power and light. Although people in tropical countries do not need to heat their homes, they do need fuel for power and light, and they need gasoline for their automobiles and airplanes. Hence many tropical countries import coal, kerosene, and gasoline. None of the Gulf and Caribbean countries produces enough coal to supply its needs, and coal is imported from the United States and Great Britain. Mexico, Venezuela, and Colombia produce huge quantities of crude petroleum. Much petroleum is refined locally, and some is shipped to the United States or Western Europe to be refined. Some of the finished products are shipped back to the Middle American countries, though two small islands near the coast of Venezuela have big up-to-date refineries.

Foods from middle latitudes. At first it may seem strange that foods should be imported into countries where crops grow continuously. One should remember, however, that some foods are produced best in middle-latitude countries, and that some tropical areas produce one export commodity and almost nothing else. A certain large sugar estate in Cuba illustrates the matter. At times this estate employs three thousand men, and the management must see that food is available for them and their families. Most of the corn, bananas, and other supply crops are obtained locally. On this estate, as on many others, the workmen trade at stores operated as part of the estate. Flour, rice, lard, smoked and salted fish—foods much in demand—are brought in large quantities from the United States, where they are produced on a large scale. The stores also have on their shelves canned foods, hardware, and other supplies bearing familiar American or European trade-marks. In the stores of this estate about 75 per cent of the stock comes from the United States via Havana; 15 per cent is Cuban; 7 per cent is European, chiefly Spanish; and 3 per cent is Mexican.

Transportation in Gulf and Caribbean Lands. Travelers in Gulf and Caribbean countries often complain that they experience difficulty in traveling from one country to another. They point out that in many cases it is easier to get to the United States or even to Europe than it is to reach a neighboring country. Nearly every Gulf or Caribbean port has steamship connection with one or more United States ports, and many of them also have services to Europe. From one Caribbean port to another, however, steamship services may be irregular and infrequent. There is, moreover, practically no railway connection from country to country. These facts explain the difficulties encountered in traveling from one country to another. The absence of local transportation merely serves to emphasize the fact that Middle America is made up of separate districts, each producing for middle-latitude markets but having relatively little trade among themselves. In recent years airways have been extended into the area from the United States. These connect all important centers and give rapid transport for passengers, mail, and light express.

Trading Facilities. Trade between the United States and the Gulf and Caribbean countries is encouraged by well-organized trading facilities. In New York and New Orleans, as well as in some of our other ports, there are exporting and importing houses which special-

ize in handling goods moving to and from Middle American points. In addition, some American firms maintain representatives in most of the Gulf and Caribbean countries. Exporting houses in the United States are in a position to deliver goods to customers in Middle American cities more quickly than goods can be obtained from Western Europe. As a result, ever-increasing quantities of goods are shipped from the United States to Middle America in small lots via parcel post and express. This trade is facilitated by the services given by banks in this country and by those in the larger Middle American cities.

Commerce of Tropical South America. The commerce of Tropical South America is in large measure the commerce of Brazil. The principal export of that vast country is provided by its huge coffee crop, grown on the uplands near the southeastern coast. Brazil's coffee export exceeds that of all other countries combined. The coffee-producing region is the largest area of fertile upland in Tropical America and has enormous possibilities for the future. Brazil exports hides and skins from the cooler southern sections of the country and cacao, cotton, and sugar from tropical lowlands.

From the standpoint of the Commercial World the Amazon section of Brazil is something like a window full of cakes and cookies beyond the reach of a hungry child. As yet mankind has not been clever enough to overcome the difficulties connected with deriving products from this region. Although the Amazon section is one of the huge lowland plains of the world and undoubtedly has great resources, its population is sparse; and even along the navigable streams, settlements are few and far apart. Large areas in the back country are unmapped, and some sections never have been explored. At present we get native rubber and some Brazil nuts from the forests, and little else.

In most respects the import trade of Tropical South America closely resembles that of the Gulf and Caribbean Lands. The principal items are machinery and tools, wheat and flour, cotton goods, coal, gasoline, and motor vehicles. All these come from middle-latitude countries.

Our Trade with Tropical South America. Our commercial relation with Brazil, and therefore our trade with Tropical South America, is more that of a customer than a merchant. In fact, our imports from Brazil are commonly more than double our exports to

that country. Two facts explain this situation. In the first place, the United States is the principal purchaser of Brazilian coffee. In the second place, Brazilian merchants long have looked to the United Kingdom, Germany, and other countries of Western Europe for most of their imports. Prominent among their imports from the United States are automobiles, petroleum products, and certain types of machinery which are better or cheaper than those of our European competitors. In trading with Tropical South America we have no advantage of distance, as in the case of the Gulf and Caribbean Lands, for Rio de Janeiro is about equally distant from New York and London. Our exports to Brazil are increasing, however, and in recent years have exceeded those of the United Kingdom.

QUESTIONS

1. What east-west line runs through the middle of Tropical America? How far north of this line does Tropical America extend? How far south?

2. Name the two major divisions of Tropical America. Which is a continental land mass? Of what is the other made up?

3. What countries have possessions in the Gulf and Caribbean Lands? How many independent Gulf and Caribbean countries are named in Figure 34?

4. In general, do lowlands or uplands border the shores of the Gulf of Mexico and the Caribbean Sea?

5. About which of these bodies of water is the lowland broader?

6. What fraction of Cuba is lowland? of Haiti? of the Dominican Republic? of Puerto Rico? of Central America?

7. What are the differences between the climates of the lowland and upland sections of Tropical America?

EXERCISES

1. *Major natural divisions of Brazil*

Write a description of natural conditions in (1) the Amazon Basin and (2) the plateau of Eastern Brazil based on what you have learned from this chapter and from Figures 14, 15, 20, and 24, and Plate IV. For each area, describe the surface of the land, the climate, the drainage, and the native vegetation.

2. *What Middle America buys from us*

The major heading "What Middle America Buys from Us" has seven subheadings. Each subheading is shown in italics and names a group of commodities. Copy in outline form the major heading and the seven subheadings.

3. *Imports into Tropical America*

Complete the following table. The left column should contain seven groups of wants, and the right should give examples of commodities imported to satisfy those wants.

Wants	Commodities
Clothing	Cotton cloth and cotton wares

CHAPTER VI

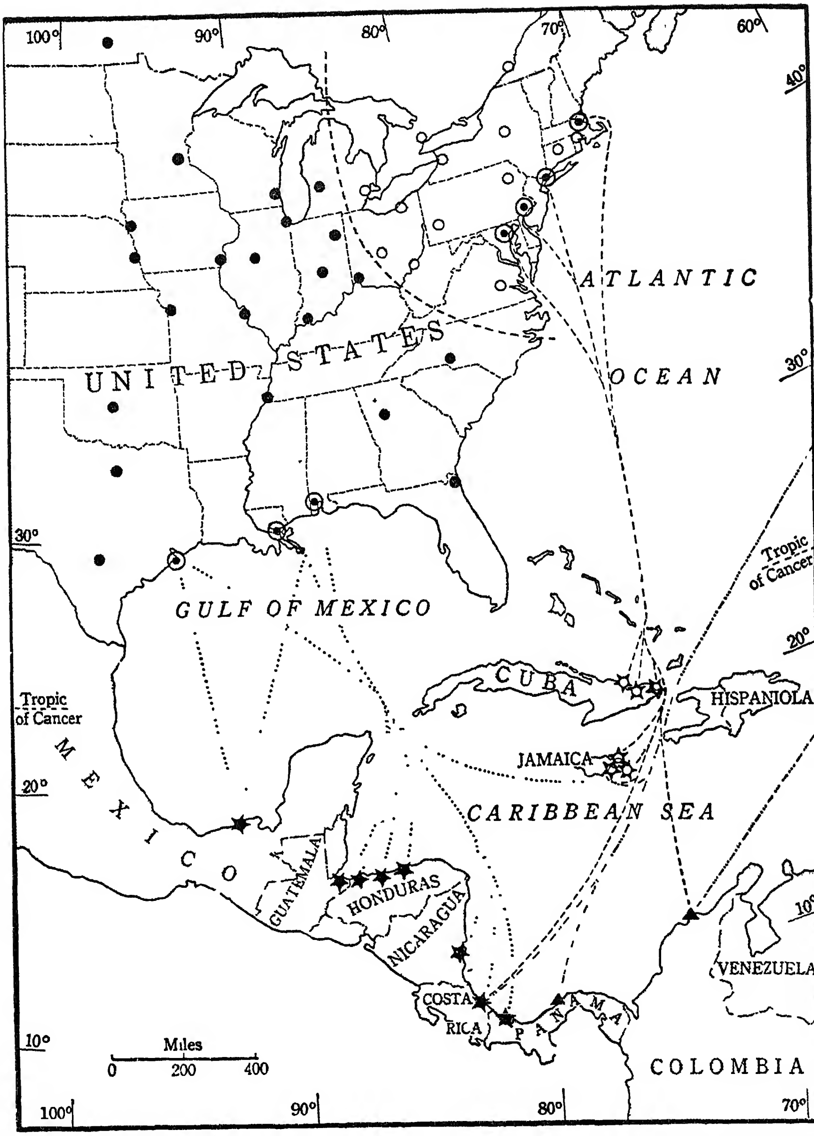
BANANA TRADE OF CARIBBEAN AMERICA

1. *Long-Distance Trade in a Perishable Product*

One of the strong commercial ties between the United States and Tropical America is the banana trade (Fig. 36). This trade touches the lives of many people in both regions. Because the trade has grown to vast size, people in all parts of the United States can get bananas at any time of year, even during the zero weather of our coldest winters and during the hot spells of summer; and many people in Tropical America can buy comforts their ancestors never dreamed of. Yet the banana is so perishable that the air of the ordinary household refrigerator is too cold for it, and even if the temperature is just right the fruit begins to spoil almost as soon as it has ripened. In fact, most of the bananas are eaten within three weeks of the time when they are cut from the mother plants. To keep us supplied regularly with this perishable fruit requires careful planning. Most of our bananas reach us after a sea journey of 1500 miles or more, and all except those going to places near the coast must stand a rail journey after that. Keeping a steady stream of perishable fruit moving to our inland cities and farms from tropical plantations in ten or twelve countries is one of the triumphs of modern commerce.

Bananas Produced and Shipped by Large Organizations. The establishment of the banana trade is the work of large business organizations. The task of keeping in every village and city of the country a quantity of this tropical fruit large enough to supply all customers, yet small enough to avoid waste, demands carefully planned shipments. The movement of bananas, moreover, requires speed and skillful care all along the way from producer to consumer. The organizations controlling the movement must know the needs of every market throughout the country and, in the light of this knowledge, direct the flow of fruit from the widely scattered tropical plantations.

The largest of the banana companies, in order to provide a constant supply for its customers, controls the production of bananas and other crops on nearly a half-million acres of land on the coastal lowlands of Tropical America, employs a force of approximately 70,000 men, operates a fleet of nearly a hundred steamships, and maintains an effi-



★, Ports shipping principally to United States Gulf ports; ☆, ports shipping principally to United States Atlantic ports; ▲, ports shipping principally to British ports; ⊙, banana ports of United States; ●, interior distributing points; ○, eastern distributing points, supplied from Atlantic ports; ......, routes to Gulf ports; ----, routes to Atlantic ports; ——, routes to Europe

Fig. 36. The banana trade. Caribbean America is the principal producing area the United States leading in consumption. The trade reflects the contrasted climate of these areas

Ports	Bunches Imported in a Recent Year	Ports	Bunches Imported in a Recent Year
New Orleans	20,120,000	Mobile	3,112,000
New York	13,805,000	San Francisco	1,828,000
Philadelphia	5,122,000	Los Angeles	1,823,000
Baltimore	4,950,000	Charleston	1,522,000
Boston	3,990,000	Total for the eleven ports	63,071,000
Tampa	3,637,000		
Galveston	3,162,000	Total for the United States	66,587,000

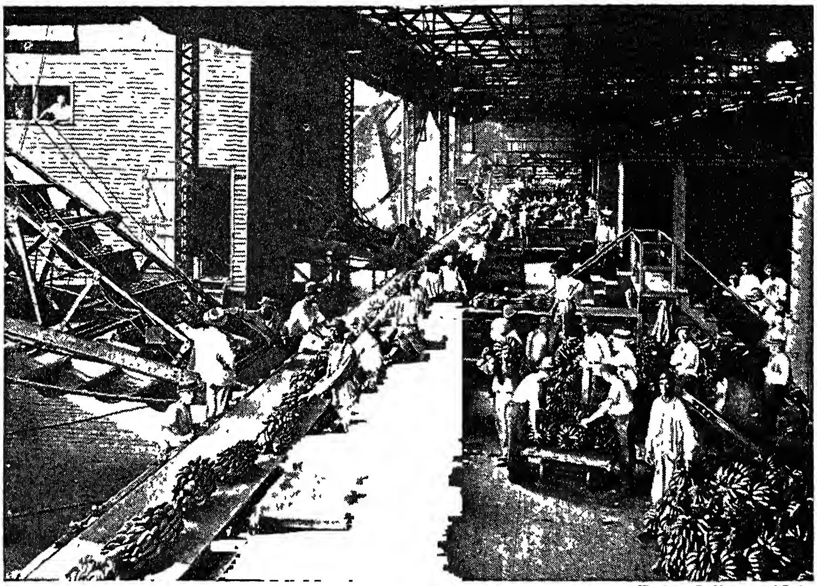
FIG. 37. Principal banana-receiving ports of the United States

cient marketing organization. In fact, this company and other similar organizations grow bananas, ship them to American ports, and distribute them in this country. In order that the whole system may work together, the companies have established railways, telegraph and telephone lines, and radio stations throughout the plantation areas.

Receiving a Banana Cargo. Bananas shipped from Tropical America arrive regularly at the ports listed in Figure 37. New York and New Orleans are our greatest banana ports, together receiving more than half the bananas imported into the United States. It is a thrilling sight to watch a banana ship steam upriver to discharge its cargo at New Orleans. The fruit-receiving wharves are equipped with machinery specially designed to handle the fruit quickly and without injury (Fig. 38), and the cargo is moved from ship to railway cars under a carefully directed system which ensures speed without disorder.

As soon as the ship is made fast the long arms of the unloading machines are lowered into the hold. Almost immediately a continuous stream of bunches of green bananas pours out of the ship and along the automatic conveyors to the line of refrigerator cars waiting on the tracks. Each car is loaded for a particular distributing center, the fruit being sorted according to its ripeness and the distance it must travel from the port. The companies plan to deliver fruit that will ripen within a few days after it reaches its destination. The work goes on with clocklike precision. As soon as enough cars are filled, a train is dispatched on fast schedule to its destination. Ordinarily, within the short space of six or eight hours the ship has discharged its cargo of 40,000 bunches or more, and the fruit cars are speeding on their way to the interior of the country.

Rail Shipments and American Weather. Bananas for interior points in the United States and Canada must travel through a region



Ewing Galloway, N. Y

FIG. 38. Unloading bananas at the port of New Orleans and transferring them to railway cars. A corner of one car shows at the right

which has both extremely hot and extremely cold seasons. The fruit cars are therefore built to give protection against either heat or cold, for both extremes are injurious to the banana. Before loading, the cars are cooled or warmed as weather conditions require; and while they are en route the ventilating apparatus keeps fresh air circulating continually among the bunches of fruit. Messengers accompany the train or meet it at important stations to regulate the temperature of the cars. In winter, Weather Bureau warnings may indicate that a cold wave is crossing the continent and that the fruit will encounter zero weather before reaching its destination. In this case the trains are run into warming sheds placed at convenient intervals along the route, and at their destination the cars are unloaded with great care to prevent chilling the fruit. All these precautions in shipping and handling a perishable product are made necessary by the changeable character of our weather.

In the Banana Country. In the plantation country, there is as much emphasis on speed and careful selection of fruit as has been noted

at New Orleans. While an incoming vessel still is far out at sea, radio messages announce its approach, and the complicated organization of the plantation system is set at work. Each manager is told how many bunches are to be taken from his plantation and when the ship will begin to load. These are important matters to the growers; for each week some of the fruit ripens, and successful production demands that cutting be done at least once a week throughout the year.

Lee, from Ewing Galloway

FIG. 39. Cutting bananas along a plantation tramway

The quality of fruit selected for the ship depends upon the length of the voyage. Thus, "fuller" fruit is selected for the five-or-six-day trip to New Orleans than for the longer trip to New York or Boston, and a "thinner" grade would be selected for the fourteen-day voyage across the Atlantic to England. As promptly as possible the freshly cut fruit is hauled to the port. Heavy rains and the rank tropical vegetation make it difficult to maintain roads or trails; consequently the companies have built in the banana fields a network of light tramways, with lines only a few hundred yards apart (Fig. 39). These tramways lead to the railways over which the fruit trains are dispatched to the port. At shipside the bunches are lifted from the cars to automatic conveyors which carry the fruit into the hold of the vessel. The work goes on so rapidly that within about fifteen hours the 40,000 to 80,000 bunches making up a cargo have been harvested, brought in from the plantation, loaded on the ship, and started on their voyage to northern markets.

Control of the Ripening Process on Shipboard. The officers in charge of a banana cargo aim to deliver the fruit at the receiving port

in a green condition. To do this, they control the rate of the ripening process by a delicate adjustment of temperature. The storage space is kept at a temperature of about 57° F. If it becomes too warm, the fruit ripens prematurely and is unfit for market when it reaches its destination; and a temperature low enough to chill the fruit checks the ripening process and permanently injures the quality. Constant watchfulness is required, and readings are taken frequently from thermometers placed in various parts of the holds. Since the banana is a living organism, drawing sustenance from the fleshy stem of the bunch, life processes are going on constantly, and these generate heat. During the first two days the engines work constantly, pumping air over the refrigerating coils and into the holds. After the temperature of the fruit has been lowered to the proper point, the refrigerating machinery is run as occasion demands.

Steamship Operation and Southbound Trade. The banana trade is helping to advance the relations of American people with our tropical neighbors, not only by adding to our food supply but also by carrying passengers, mail, and United States products to the Caribbean countries. Bananas form a one-way cargo, and it is difficult to make a profit on ships which do not carry paying freight on their return trips. American exports to the plantation country furnish part cargo for the return voyage. In addition to export commodities, the banana ships carry mail, and many of them are fitted for passenger traffic. These services not only increase the profits of operating the ships but also encourage friendly relations between middle-latitude and low-latitude peoples.

Regions Involved in Banana Trade. Three large areas are of outstanding importance in the banana trade. The United States and Western Europe consume about three fourths of all the bananas of commerce, the United States consuming the larger part. Both areas buy mainly from the Gulf and Caribbean Lands, and these lands produce more than two thirds of the world's commercial supply. The largest quantities come from countries bordering the western Caribbean (Figs. 40 and 36). The producing areas lie on the coastal lowlands near the banana-exporting ports. From these ports bananas are shipped to New Orleans and other Gulf ports of the United States, to New York and our other Atlantic ports, and across the sea to the ports of Western Europe (in Fig. 36 notice the origin of the fruit shipped to each of these market areas). In addition to these major

Imported from	Bunches in a Recent Year	Imported from	Bunches in a Recent Year
Mexico	16,766,000	Panama	7,224,000
Guatemala	8,874,000	Colombia	4,612,000
British Honduras	839,000	Ecuador	1,079,000
Honduras	9,382,000	Jamaica	85,000
Nicaragua	2,501,000	Cuba	8,534,000
Costa Rica	4,948,000	Haiti	1,379,000

FIG. 40. Countries from which the United States imports bananas

ıovements, there are minor movements in a few other parts of the 'orld—from the Canary Islands and Brazil to Europe; from Ecuador ›uth to Chile and north to California and New York; from the [awaiian Islands to our western ports; and from Taiwan (Formosa) › Japan.

. *Bananas Produced in Humid Tropical Lowlands*

Commerce Starts the Industry. When the United States celebrated s hundredth anniversary with a world's fair at Philadelphia in 1876, :w people in this country ever had seen a banana. At that time the ›astal lowlands of Central America were a wilderness with few ıhabitants. Into the wilderness came a few men of imagination and ›urage, and from small beginnings a new industry developed. Like ıany commercial developments of the tropical lowlands, the indus-y was started by men from a middle-latitude country—men who new the possibilities and resources of middle-latitude markets. The ifficulties which these men encountered are similar to those met ,erywhere in opening the humid tropical lowlands to settlement.

The beginning of large-scale banana production in Central Amer-:a was associated with the building, in the 1870's, of a railroad from ,imón on the Caribbean coast to San José on the upland of Costa .ica. Central America consists of a narrow plain bordering the Carib-ean and a broader upland belt of flat-floored basins several thousand :et above sea level (Fig. 33). The upland basins even now are the ıost densely peopled sections; but in the 1870's they contained prac-cally the whole population. A hundred miles from the coast lies an José, the Costa Rican capital, surrounded by farm lands with elds of corn and potatoes, coffee groves, and pasture lands where

cattle graze. In those days the Costa Ricans took their surplus coffee and cattle hides down steep mountain trails to the Pacific shore for

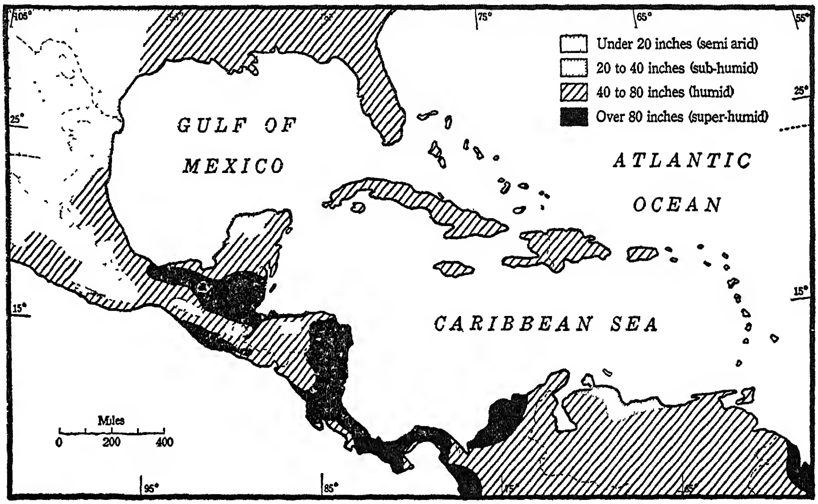


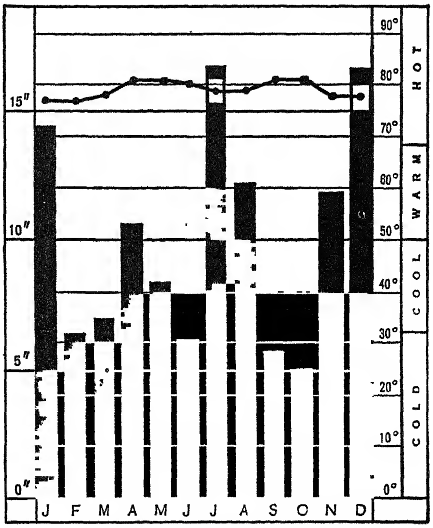
Fig. 41. Rainfall of the Gulf and Caribbean Lands

shipment to San Francisco. They could reach a Pacific port without going through a dense tropical jungle, for less rain falls on the Pacific side of the mountains (Fig. 41); but the market areas reached by Pacific trade routes are not so populous as those on the shores of the North Atlantic. Hence the government wished to connect the upland cities with the Caribbean coast and the trade of the Atlantic.

Creating a Market for Bananas. The difficulties of building the railroad across the forested coastal lowland led to the establishment of the banana industry. Unforeseen difficulties delayed construction; and for years the railroad began and ended in the wilderness, with the traffic of the upland still far out of reach. In the hope of making the wilderness yield some traffic for his railroad, the American engineer in charge got the idea of raising bananas to sell in the United States.

To build up the market, he purchased bananas each month in Panama and shipped them to New Orleans. Before many years the fruit had become popular in New Orleans, and plantations in Costa Rica were supplying the demand. Success in Costa Rica led to plantings in other Central American countries. Similarly, Boston merchants were instrumental in establishing plantations in Jamaica.

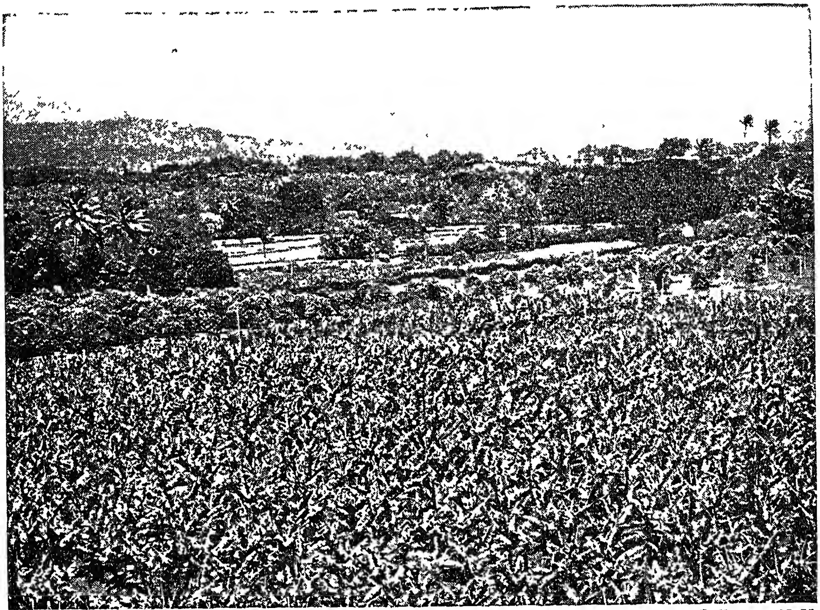
Problems of Producing Bananas. The pioneers in the banana industry of Tropical America found many problems to be solved. They had to learn a new industry and at the same time learn how to live in a new environment. While some of the problems still baffle human efforts, much progress has been made; and at intervals along the coast the wilderness has given place to prosperous settlements. Since these areas have been opened to settlement and commerce, some of the jungle within reach of the banana ports has been reclaimed for the purpose of growing such crops as cacao and coconuts. Man records one more triumph in his age-long campaign to occupy the earth.



Elevation above sea level, 10 feet
Average annual rainfall, 122 inches

FIG. 42. Temperature and precipitation of Limon, Costa Rica. This chart shows how the rainfall and temperature of Limón, vary from month to month. The vertical bars above the initial letters of the months represent rainfall, and the amount in each case has been found by averaging the rainfall for a period of years. The scale for reading the amount of rainfall is given in inches in the left-hand column. Near the top of the chart are twelve circles so placed as to represent the average temperature for the months, the temperature scale in degrees Fahrenheit being given at the right, just after the December column. The line connecting the circles is called the "temperature curve"

Conquering the tropical forest. Wherever they establish their plantations the banana companies face the task of clearing the forest-covered land—a stupendous undertaking. In these lowlands the annual rainfall is from 80 to 100 inches or more, and every day is warm (Fig. 42). In such a combination of moisture and heat vegetation grows luxuriantly. The rising sun looks on leaves dripping with dew. The spreading branches of the taller trees shade a thick undergrowth of small trees, palms, shrubs, vines, and ferns. Bright-colored birds fly among the trees, reptiles crawl in the swamps, and the air is vibrant with the hum of insects. This abundance of plant and animal



Ewing Galloway, N. Y.

FIG. 43. A large banana plantation in Guatemala

life presents grave problems to man, but it also betrays the productive capacity of the land. The first attack is made upon the undergrowth. This mass of shrubs, ferns, and vines is cut down with "machetes" and left on the ground where it falls.

Planting the new crop. When the dense undergrowth has been cut, the planter continues his campaign by putting banana plants into competition with the native vegetation. Cuttings taken from the rootstocks of vigorous banana plants are set in holes among the fallen underbrush. The large trees are left standing for a time, because their shade is good for the young banana plants and hinders the growth of weeds. Later these trees are felled and left on the field. Under the action of heat, moisture, and fungi, assisted at times by the ravages of hungry termites (white ants which feed upon wood), the mass of vegetation rapidly decays. Even the larger logs rot away within two or three years. Within a few months the banana plants are large enough to shade the ground, and their shade, together with the care given by man, prevents the return of the native vegetation (Fig. 43).

Working a plantation. There is no slack season on the plantation. The planted fields must have frequent attention; for weeds and

undergrowth grow so fast that if left alone they soon turn a cleared space into a jungle. Furthermore, harvest is continuous. Although the individual plant bears its bunch of bananas and dies, the real stem, or trunk, is the underground rootstock; and this lives on from year to year, frequently sending up new shoots, or "suckers," which will develop into banana plants. Periodically, while the men are chopping out the weeds from the fields, they cut down most of the "suckers." By leaving young plants of different ages they manage to have bananas ready for harvest every week in the year.

New clearings are made from time to time; for the huge banana plants impoverish the soil, and the yield of a field declines after about ten years of production. Then the field is left fallow for a period of years or planted to other crops. It is necessary always to have a labor force ready for repairs and emergencies. The jungle must be checked as it encroaches on pastures, clearings, and railways. Drainage ditches must be kept in repair to protect the fields from flooding, and washouts are common in the rainy season.

Making tropical lowlands habitable. From the beginning the banana companies have carried on a war against disease. The dangers of the environment are proved by the fact that it cost the lives of 4000 men to build the first 25 miles of the Costa Rican railway. Agricultural settlement under such conditions could not have been permanent, and in the 1870's practically nothing was known in America of tropical medicine and sanitation. The banana companies, in their efforts to safeguard the lives of their workmen, have profited by the knowledge of scientists and physicians familiar with life in India, Java, and other parts of the long-settled tropics; they have gained much practical experience on the plantations; and they have been guided by recent discoveries of science.

Wooden houses raised above the ground on concrete pillars are provided for the workmen, doors and windows are screened, tanks to catch rain water for drinking purposes are protected from mosquitoes, laborers are instructed in sanitation, and kerosene is used freely in the war upon mosquitoes. All the large plantation districts have hospitals with a corps of doctors and nurses skilled in the treatment of tropical diseases. Finally, the companies make it possible for the workmen to secure wholesome and nourishing food. Each house has a little garden plot, where the workman and his family may grow vegetables and fruits for their own use; the plantation stores sell food

materials produced on the upland farms and other foods imported from the United States; and some of the companies maintain dairy herds to supply milk and butter.

Financing a plantation. Who pays the bills for all the expenses connected with establishing and running a banana plantation? After purchasing the land the company must wait at least three or four years for the first harvest. In the meantime someone must pay for clearing the forest, for planting and cultivating the crop, for roads and railroads, and for the necessary houses, hospitals, and other buildings. Some plantations represent investments of hundreds of thousands of dollars. Most of this money (or capital, as bankers say) is furnished by companies in the United States or some other middle-latitude country. Each man in the company furnishes part of the funds necessary and shares in the profits or losses of the enterprise. When once the capital is available, a director or manager is hired to run the plantation. Such investments outside our own country are what people mean by "American investments abroad."

Spacing holdings to minimize losses from tropical storms. One large company owns banana plantations in six of the countries bordering the Caribbean, its holdings extending from Jamaica and Guatemala to Panama and Colombia; and recently it has started plantations in Ecuador (Figs. 33 and 36). Other companies likewise spread their holdings into several areas. In no one of the countries is all the suitable banana land occupied, but the experience of growers in Jamaica shows how unwise concentration in one district would be. In 1915, 1916, and 1917 a series of hurricanes wrought destruction in the plantation areas. The industry recovered gradually, and exports rose to more than 24,000,000 bunches. In 1932 a severe hurricane struck the island, and exports dropped to 10,600,000 bunches in 1933. Other hazards confront the tropical planter. Drought or flood may ruin a field, or disease may attack the banana plants, as has happened in some areas. But disaster is not likely to strike all the plantation areas in the same year, and wide distribution of holdings is a safeguard against total loss.

The "Why" of Location. How does it happen that, of all the places in the world, the banana industry grew up on the lowland borders of the Caribbean? Was it merely because a few Americans chose to purchase land there and develop it, or do the Caribbean countries possess advantages which are lacking in the rest of the world?

The nature of the banana plant limits cultivation to humid tropical lowlands. Because of its growing habits the banana plant thrives only in the more humid sections of the low latitudes. The relation of the plant to its tropical home can be seen by examining its habits, one by one:

1. The banana plant requires twelve or fourteen months to grow from a cutting to its full size and to mature its fruit. Therefore it thrives only in a location which is always free from frost.

2. In little more than a year it grows to treelike size, reaching, under favorable conditions, a height of 30 feet; while its "trunk" attains a diameter of about 16 inches at the base, and the great spreading fronds form a crown 15 to 20 feet across. In order to make this rapid growth, it requires (1) a rich soil, (2) enormous quantities of water to carry the dissolved soil minerals up from the roots to the leaves and fruit, and (3) high temperature and intense sunlight to speed up the food-making processes which take place in the leaves.

3. It knows no season, but blossoms and matures its fruit every month in the year. Consequently it thrives best where the temperature and rainfall are practically the same at all seasons.

4. At the top of a weak stem, it holds aloft a bunch of fruit weighing from 50 to more than 100 pounds (Fig. 39). A windstorm would send the fruit crashing to the ground.

These conditions (high temperature and intense sunlight throughout the year, abundant and regular rainfall, and freedom from wind) exist together only in the tropical belt, which extends, with varying width, around the earth on both sides of the equator. The margins of the belt are less favorable for banana culture than the middle portions; for areas near the margins have a dry and somewhat cooler winter season and are subject to occasional severe tropical windstorms. The heaviest and best-developed bunches imported into the United States come from Panama, within ten degrees of the equator, and the lightest bunches come from Cuba, which lies near the northern margin of the tropical belt (Figs. 33, 36, and 14). At altitudes of a few thousand feet above sea level, occasional frosts preclude banana culture. Thus by its own habits of growth the banana is limited to the humid tropical lowlands.

Location favors Middle America. Throughout the lowlands of the humid tropical belt bananas form a staple food; but nowhere else in the world are they grown on as large a scale as in the Caribbean countries. In addition to a climate suitable for growing the

banana, the plantation areas of these countries have a location favorable for marketing it. They are near the sea, so that fruit is loaded on the refrigerator boat within a few hours after it is cut, and they have the great advantage of nearness to the large markets of Eastern United States. No other humid tropical area has an equally favorable location.

QUESTIONS

How thoroughly did you read section 1? See how many of the following questions you can answer without looking back.

1. What large areas together consume more than half the bananas of commerce? What grades of population density have these areas?

2. What two ports receive more than half the bananas imported into the United States? Are they Gulf ports or Atlantic ports?

3. What country furnished one fourth of the bananas imported into the United States according to Fig. 40?

4. What Pacific ports of the United States import bananas?

5. In what general direction do most of the ships travel when they are carrying banana cargoes?

6. How many ports on the coasts of Central America ship large quantities of bananas? How many on the coasts of all the Gulf and Caribbean Lands?

7. Two ships sail out of Port Antonio in Jamaica, one heading for New York and one for Liverpool. Which has the longer voyage before it?

8. Are the banana holds of the ships kept at a temperature that would be comfortable for your classroom, at a lower temperature, or at a higher one?

9. What soon happens to a neglected road in the banana country?

10. Most of the ships which carry bananas from Mexico to the United States deliver their cargoes to Gulf ports, and most of those from Cuba go to Atlantic ports. Why is this logical?

11. The *Santa Barbara* was within 24 hours of the port where it was to take on bananas. All that day the refrigerating machinery was pouring cooled air into the hold where the fruit would be stowed. Why?

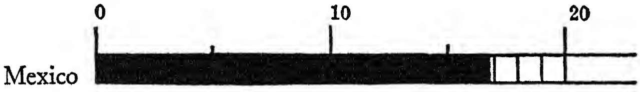
12. Which of the following cities receive their bananas through Gulf ports: St. Louis; Detroit; Pittsburgh; Omaha; Buffalo?

EXERCISES

1. *Where we buy bananas*

a. Make a graph entitled "Where We Buy Bananas." Arrange the countries listed in Figure 40 according to their importance in supplying our banana imports. Let one space on your graph paper represent 1,000,000 bunches.

Mexico, for example, sent us 16,766,000 bunches, and the line to represent it would occupy approximately $16\frac{3}{4}$ spaces, thus:



b. When your graph is finished answer the following questions: From how many Central American countries do we buy bananas? From how many South American countries? From which country do we buy most?

2. *Why one country produces more bananas than another*

After reading section 2 of this chapter, list the factors which might cause one country to produce more bananas than another.

3. *Can you keep your bearings?*

Do you know your geography well enough so that you are at home in the countries interested in the banana trade? Test yourself by means of the following questions.

a. A banana train pulls into the station with snow on the roofs of the cars. Is it traveling in a banana-growing or a banana-importing country? How do you know?

b. At four o'clock in the afternoon the sun shines through the portholes on the starboard (right-hand) side of a banana ship on the run between Cuban ports and Philadelphia. Is the ship probably loaded with bananas or with products from factories in the United States?

c. Argentina imported 8,425,000 bunches of bananas in a recent year. What is the nearest country from which these shipments might have come?

d. Argentina is farther south than Honduras. Why does it not grow its own bananas instead of importing them?

e. Mr. X stands on the wharf at New Orleans, directing the men who are loading a refrigerator car with bananas for St. Paul and a truck for a New Orleans fruit dealer. A workman walks toward him carrying a bunch of ripe bananas. Into which vehicle will this bunch be placed?

CACAO: A PRODUCT OF PROTECTED SITES IN HUMID TROPICAL LOWLANDS

Cacao, like corn and the potato, is an American contribution to the food supply of the world. Among the presents sent by Cortez to his royal master, Charles V of Spain, was a package of cacao beans—a gift destined to be of greater significance than all the gold which Cortez wrested from the conquered Aztecs. Cortez learned about cacao in Mexico, where "chocolatl" long had been served at the feasts of Montezuma in his capital on the central plateau. In order to supply the Aztec emperor with this drink, cacao beans were exacted as a tribute from subject tribes on the humid tropical lowlands. Within the present century the production of cacao has grown into an important industry, and the use of cocoa and chocolate has become widespread, particularly in Europe and the United States.

Where Cacao Is Produced. Nearly the whole world supply of cacao comes from four areas: West Africa, Caribbean America, Eastern Brazil, and Ecuador (Fig. 44). Nearly two thirds of the total comes from West Africa, where producing districts are scattered along the coast from Sierra Leone to Belgian Congo. Three of the four cacao-exporting areas front on the Atlantic or its tributary seas, and Ecuador has a direct route to Atlantic markets by way of the Panama Canal. In the cacao industry, as in many other industries, both the principal producing areas and the principal consuming areas face the Atlantic.

The cacao tree thrives in approximately the same environment as the banana but is somewhat more delicate. Since blossoms open and fruit ripens every month, cacao flourishes only in lands which are warm at all times of the year. Its leaves are adapted to the steamy shade of the tropical forest, and if exposed to strong sunlight and drying winds they shrivel and die. Drying winds also check the development of the fruit. Cacao culture is therefore confined to tropical areas where moisture is available throughout the year (Figs. 42 and 14), and in such areas it is restricted to sites protected from wind.

Caribbean Estate Illustrates Conditions Essential to Cacao Culture. A cacao estate in the northern part of the island of Trinidad illustrates the qualities of a favorable site. The estate is situated in a valley cut in the south-facing slope of the mountains which run parallel to

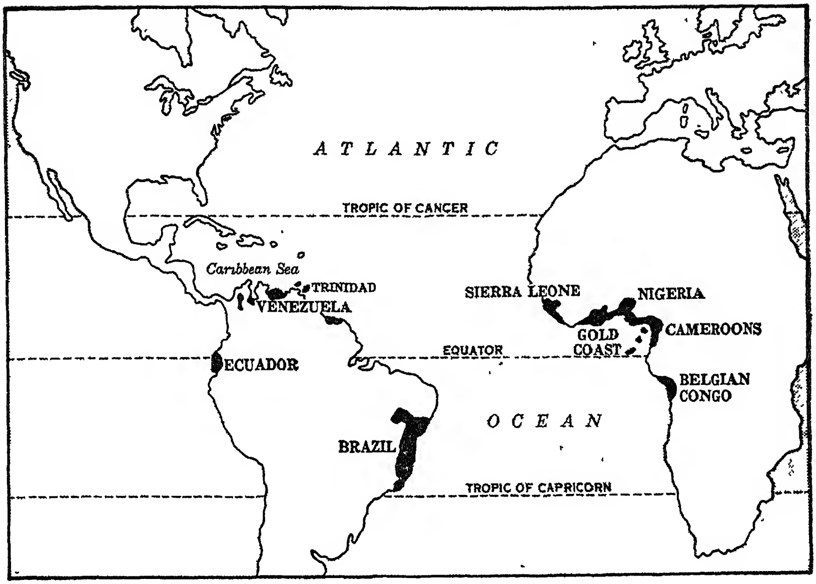


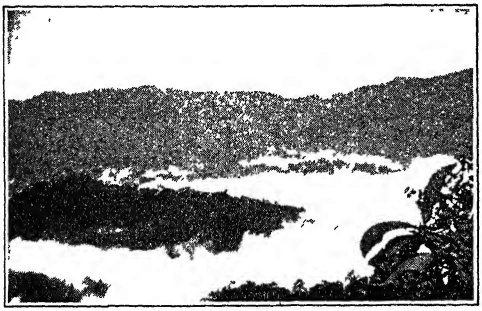
FIG. 44. Principal cacao-producing areas of the world

the north coast. Therefore it is protected from the prevailing northerly winds. This section of the island has more than 80 inches of rain during the year and has no dry season. The supply of moisture, consequently, is regular. Moreover, night fogs frequently fill the valley, lingering in the morning until the sun dissipates them (Fig. 45). Shade trees planted with the cacao serve to delay the escape of moist air from the groves. These trees rise high above the low-growing cacao trees, and beneath their shade the air remains hot and steamy. About midday white clouds form on the mountain slopes, and drenching showers occur at intervals throughout the afternoon.

In the matter of soil and drainage the plantation is well located, for it lies on the floor and lower slopes of the valley. The rich, deep soil is both moist and well-drained; for the ground water, working its way downward through the soil toward the river in the lowest part of the valley, is renewed constantly from above but never becomes stagnant. This condition of a well-watered and yet well-drained site is highly important in cacao culture.

Brazilian Crop from Area of Primitive Transportation. Brazil furnishes an example of an area producing a large crop in spite of the handicap of primitive transportation. The cacao district is a hilly

coastal strip some 360 miles long (Fig. 44 and Plate IV). There are only a few short railroads and improved highways in the district. The crop of about 100,000 tons is carried at considerable expense to a dozen small ports. There the cacao is picked up by sailing vessels and landed at Bahia, the leading cacao-exporting port of the district. Fortunately for this area, cacao does not demand the rapid and regular transportation services that are necessary for the commercial production of bananas.



Preston E. James

FIG. 45. Fog-filled valleys on the south slope of the northern range of Trinidad at 6:10 A.M. of an August day

Ecuadorian Production on Alluvial Lowland. In Ecuador, cacao groves occupy small areas in the Guayaquil lowland, an alluvial (river-built) plain between the coastal mountains and the Andes. An arm of the Pacific Ocean once extended northward beyond the present site of the port of Guayaquil. But many short rivers, rising in the snow-covered Andes, are slowly filling the gulf, building a flat plain at the north end and along the eastern edge. In times of flood, the river water is very muddy with "alluvium" brought from the mountains. The river banks are too low to hold the swollen streams, and the muddy water spreads over the flat land. Slowly the mud settles, leaving a new layer of alluvium on the plain. The layer is thickest near the stream, where the escaping water is muddiest. Thus the river banks are built up a few feet higher than the rest of the plain, forming broad, low alluvial ridges known as "natural levees." The cacao groves are planted on the natural levees, where they have good drainage and never lack moisture. The Ecuadorian coast is free from storms, and conditions are so favorable in the lowland that cacao trees grow wild in the forest.

Cacao production in Ecuador is threatened with destruction by diseases which man has not learned to control. One of these, caused by a fungus parasite, is particularly harmful because it injures the tree as well as the fruit. It spread rapidly in the early 1920's, and within ten years the Ecuadorian crop dropped to less than half its

former size. Although scientists are studying the problem, no remedy is in sight. This is but an example of the conflict that is on. Man's right to occupy the earth is disputed by a host of diseases and insect pests that prey upon cultivated crops. These are our greatest enemies, and the conflict will decide whether we or they will occupy the earth.

The experiences of growers in the Guayaquil Lowland during recent years illustrate the fact that cacao and the banana thrive in the same environment. After trying a number of crops already familiar in the area, large numbers of growers began producing bananas on former cacao land. The choice among the various crops was made after trying to find what crops could be sold in large quantities. Bananas long had been grown for shipment south to Chile and Peru, but not very large quantities could be sold in these countries of small populations. In the early 1930's American fruit companies established offices in Guayaquil and began making regular purchases of bananas, shipping to the United States. The assurance of a regular market encouraged production, and now Ecuador exports to the United States more than a million bunches annually.

Large Production in West Africa. The rise of West Africa as a producer of cacao illustrates the likelihood of change in industry and trade (Fig. 44). Several small islands in the Gulf of Guinea were the first important producers of the region. In 1891 a single bag of cacao was exported from the Gold Coast, then a little-known colony. Now the Gold Coast farmers produce more than a third of the world's cacao, and the Nigerian farmers are both increasing the volume and improving the quality of their crop. The introduction of cacao culture into West African colonies has changed the life of native peoples in these pioneer areas, has lowered the price of cacao in world markets, and has led planters in older producing areas to modify their methods of culture.

The government encourages cacao culture. It was a native farmer returning from a journey who first brought cacao seeds into the Gold Coast; but in the rapid growth of cacao culture the guiding hand of the British government may be seen. Most of the cacao is produced by native farmers on small farms scattered through the forest. To encourage these tribesmen in the cultivation of a profitable cash crop, the government experiment stations furnish planting stock and teach the farmers how to care for the trees and the fruit. In Nigeria the government also maintains plants where the farmers may have

their cacao prepared for market. The help of the government is important because cacao is a new crop in West Africa, and the people know little about its cultivation or its use.

A second way in which the government aids cacao-growing in the Gold Coast is by improving transportation facilities. Some of the cacao-producing villages are 300 or 400 miles from the coast. The rivers are not navigable, and the people cannot keep horses or other draft animals on account of the tsetse fly. Formerly the only method of transportation was head porterage, and even yet the people carry the cacao on their heads from the farms to the villages where the beans are dried. The government, with the co-operation of native chiefs, has planned and begun to build modern roads, extending the system as fast as funds can be obtained. Three lines of railway lead back into the cacao country, and there are several thousand miles of motor roads over which trucks haul cacao to the railways or to the ports. These facilities greatly reduce the cost of transportation.

Environment suitable for the crop. Success has crowned the efforts of cacao-growers and the government because the environment in the Gold Coast is suitable for the new crop. The cacao-growing area is a forested lowland within six or seven degrees of the equator. The virgin forest soil is rich, and the climate is similar to that of the banana lands. The temperature is always high, rain falls every month, and the air in the tropical forest is humid. Growing conditions are so favorable that many trees still are bearing at the age of twenty-five or thirty years, although they have had little cultivation and no scientific care.

Weather conditions favor the harvest and shipping of the crop as well as its cultivation. Though cacao is ripening at all times of year, about three fourths of the crop matures in the somewhat drier season between September and February. The fair weather simplifies the task of drying; for cacao molds in cloudy, rainy weather, and the natives have no means of drying it artificially. The drier season is an advantage also in sending the crop to market; for in the rainier months washouts are frequent, and the roads get so soft that hauling has to be discontinued.

At the ports too the fair weather of the principal harvest season is an important asset. The Gold Coast has no natural deep-water harbors, and until a few years ago its business with the outside world was too small to justify the building of harbors, docks, and ware-

houses. Port works have been constructed; but building has not kept pace with the rapid growth of the cacao industry. Every year the warehouses at the principal shipping points are filled to overflowing, and thousands of bags are piled on the beach in huge canvas-covered stacks. The ships anchor a mile or more from shore and are loaded by surf boats, which ply back and forth between shore and ship. It is very difficult to protect the cacao from rain while it is on the shore or in the surf boats. Since wet cacao is likely to mold during the voyage, shippers welcome the fair weather and quiet seas of the harvest season, when shipments are heaviest.

Effects on the industry in other areas. Some years ago the large export of cacao from West Africa led to a sharp decline in price. In Tropical America profits for growers fell off, and many planters were driven out of business or turned to the production of other crops. In Trinidad, for example, hard times on the cacao estates cut down the profits of merchants and even of the streetcar companies. Some planters, however, are making a fair profit in the face of competition. They are men whose plantations occupy favorable sites and who have adopted improved methods of culture. They keep their cacao groves free from weeds, prune the trees annually, apply fertilizer to the soil, and carefully remove the mosses and small orchids which establish themselves on the branches of trees. By intensive culture these planters secure a yield averaging about three pounds per tree, whereas under the primitive methods formerly practiced the average yield per tree was less than one pound.

Quality Related to Methods of Curing. Although West Africa and Brazil rank as the largest producers of cacao, Caribbean America and Ecuador excel in quality. High quality depends in part upon the variety of tree but is due in large part to skill and care in gathering and curing the beans. It is partly because they lack skill that the Brazilian and West African growers send out an inferior product. The fruit of the cacao tree is a tough-skinned pod which looks somewhat like a large, thick cucumber and which contains several dozen beans embedded in a slimy, sweetish pulp (Fig. 46). When the beans are taken out of the pod, the pulp clings to them, and if it is not removed, it hinders their drying. In the Caribbean area the beans are piled in bins, covered with banana leaves, and allowed to "sweat," or ferment, for a period of from three to six days, according to the variety. From time to time they are stirred or turned so that fermentation may be

even. Then they are dried in the sun (Fig. 47). Fermentation loosens the pulp, destroys the bitter taste, develops the desired aroma, and makes the beans dry more readily.

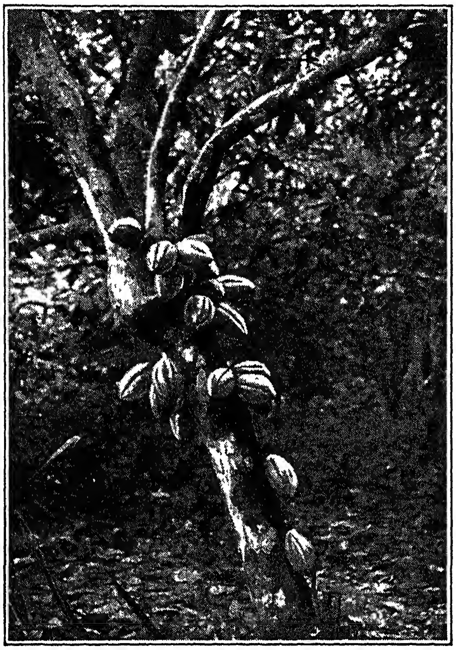


FIG. 46. Cacao pods and trees

It is logical that the best quality of cacao should come from Tropical America, where the people have long been accustomed to care for the crop. The inexperienced growers of West Africa do not sort the pods properly, much of their cacao is imperfectly fermented, and frequently they send it to market only partly dried. At times part of their cacao has been refused entrance at American ports because of the large proportion of moldy and wormy beans.

Trade and Manufacture of Cocoa and Chocolate. Most of the cacao of commerce moves over the Atlantic Ocean to Eastern United States and Western Europe. Hamburg, Le Havre, and London are the chief importing points in Europe, and in the United States New York is the outstanding point of entry. These ports take leadership because of their numerous steamship services to the producing countries and also because they command highly developed and densely peopled market areas.

At the importing ports cacao beans are manufactured into the cocoa and chocolate with which we are familiar. These ports are convenient points from which to distribute goods into the interior, and the prepared cocoa and chocolate can be shipped more cheaply than could the heavier and bulkier cacao beans. The advantage of manufacturing near the point of entry is suggested by the location of the industry in New York. There the factories are localized on lower Manhattan Island, near the docks where cacao is discharged from the ships. Elaborate machinery has been devised to clean, grind,

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FIG. 47. Drying cacao beans on a plantation near Limón, Costa Rica. The trays are exposed to the sun during the day, but at night they are stacked on the flat cars and hauled into the sheds

and roast the beans and to extract the fat from those which will be used for making cocoa. This machinery is so expensive that the manufacture is carried on by a relatively few large firms.

Before it reaches the consumer, most of the cocoa or chocolate is manufactured into chocolate products. This phase of manufacture is widespread. The making of confectionery, cakes, and other food products can be carried on with simple equipment. Moreover, freshness is so highly esteemed in these products that they are to a large extent manufactured for sale to near-by customers. Bakeries and candy manufacturers in many cities secure cocoa and chocolate from the port factories in the form of liquor or tablets, and chocolate products are sold under many familiar trade names.

QUESTIONS

1. Does the origin of the cacao tree make it logical for West Africa to be the leading cacao-producing area? Why?

2. What conditions of temperature, moisture, and wind favor the growth of cacao?

3. Why is modern transportation of less importance in the marketing of cacao than of bananas?

4. Where is the cacao-producing section of Brazil? What port leads in exporting Brazilian cacao? How does the cacao get to that port?

5. How did nature build the plain on which the Ecuadorian cacao crop is grown? What advantages has this area for cacao production? What misfortune has it had recently?

6. What had the British government to do with the growth of the cacao industry in West Africa?

7. Which area uses better methods in curing cacao, Trinidad or West Africa? Why?

8. What is done with cacao beans to prepare them for market?

9. Why is the manufacture of chocolate from cacao beans a feature of ocean ports rather than of inland cities?

EXERCISES

1. *Chocolate in modern life*

Prepare a talk about chocolate in modern life. Bring out the uses of chocolate and the several kinds of stores which handle chocolate products.

2. *On a cacao estate*

Write a short theme based on Figure 47. Devote one paragraph to each of the following points: (1) indications that this estate is in a tropical country; (2) the work of the people in the foreground; (3) the purpose of the shed, the trays, and the little car tracks; and (4) evidences that this area has commerce with middle-latitude countries.

CHAPTER VIII

SUGAR: A WIDELY PRIZED PRODUCT DERIVED FROM TWO UNLIKE PLANTS AND TWO UNLIKE ENVIRONMENTS

1. *Sugar in World Trade and the Sugar Supply of the United States*

Who Eats Sugar? The average person in the United States eats more than a hundred pounds of sugar every year. Although this is the average person's share of the sugar consumed in the United States, it is much more than the world's per capita consumption. If the total sugar produced in a year were equally distributed among the people of the world, each person would receive about twenty-five pounds. Sugar consumption per capita, however, varies greatly from country to country. In some countries most of the people are able to buy the foods they prefer, while in other countries the majority of the population finds it necessary to choose the food which is cheapest. The customary diet of some people, moreover, includes raisins, figs, or other foods which contain considerable sugar.

Who Grows Sugar? Sugar in some amount is grown in nearly every country, but only a few countries produce enough for export. Widespread culture of sugar is possible because there are two important sugar-producing plants and because one of these plants grows in low latitudes and one in middle latitudes. Sugar cane requires from twelve to eighteen months of continuous growth to mature, and thus it flourishes only in low latitudes. Cuba, India, and Java are the principal countries producing this kind of sugar (Fig. 48). The sugar beet matures in from four to five months and thus is grown in middle latitudes. Most of the world's beet sugar is produced in Europe, but the United States and most other countries with a suitable climate produce a little.

Major Divisions of Trade in Sugar. Commerce in sugar includes four main divisions, associated primarily with supplying sugar to the major four densely peopled regions of the world. Imports of cane sugar into the United States and Canada, largely from the West Indies, Hawaii, and the Philippine Islands, make up the first and largest division of the sugar trade (Fig. 49). The United States, in fact, takes nearly 40 per cent of the world's imports. The second divi-

Raw Cane Sugar		Raw Beet Sugar	
Country	*Short Tons*	*Country*	*Short Tons*
Total production	23,905,000	Total production	12,000,000
United States	510,000	United States	1,376,000
		Canada	61,000
Cuba	3,360,000		
Puerto Rico	997,000	Sweden	358,000
Other West Indies	1,174,000	Denmark	254,000
		Netherlands	248,000
Brazil	1,055,000	Belgium	266,000
Argentina	414,000	United Kingdom	510,000
Peru	448,000	France	1,034,000
Hawaii	1,014,000	Germany	2,330,000
		Italy	382,000
Japan (chiefly Taiwan)	1,476,000	Spain	226,000
Philippines	1,103,000	Other Western Europe	1,102,000
Java	1,568,000		
India	7,355,000	Soviet Union (U.S.S.R.)	2,800,000
China	441,000	Poland	620,000
Australia	896,000	Hungary	132,000
Union of South Africa	476,000	Rumania	96,000
Other Africa	694,000	Other Eastern Europe	166,000

FIG. 48. The sugar crop of leading countries in a recent year

sion consists of the imports into Western Europe, primarily into the United Kingdom and France. These markets are supplied in part from European sugar-beet fields and in part from the East and West Indies. The third division of the world's sugar trade is the import movement into Japan and China from their tropical neighbors Samoa, Taiwan, the Philippine Islands, and Java (Fig. 49). Finally, there is the Indian Ocean trade, consisting largely of imports into India from Java and from the small but productive island of Mauritius. Although India and China produce large quantities of sugar, they do not produce enough to supply their own markets. The large demand in those countries, however, is due to their enormous populations and not to a high per-capita consumption.

European Sugar Supply. The countries of Western Europe, with their numerous and generally prosperous populations, consume much sugar. They import some cane sugar but draw their principal supply from their own sugar-beet fields or from near-by countries. In general, the sugar is hauled only short distances, and most of the trade is between parts of a country rather than between countries. Poland and Belgium, however, export sugar to Great Britain and the northern countries of Europe.

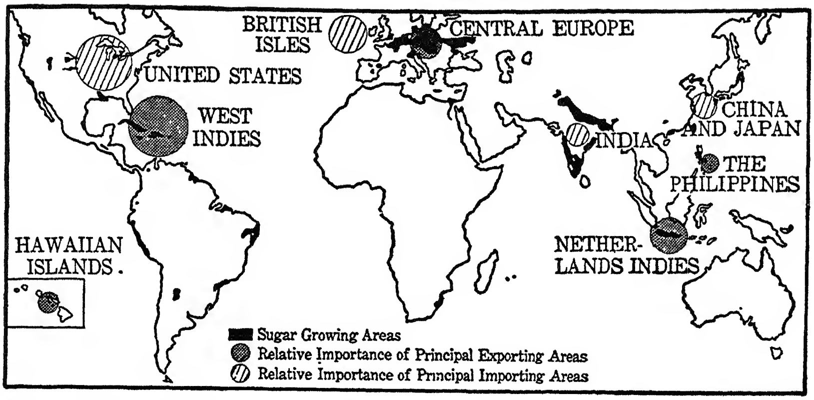

FIG. 49. Principal sugar-producing and sugar-consuming areas of the world

Sugar-beet culture extends in an irregular belt eastward from the English Channel across Germany and southern Poland into the Soviet Union, the major producing areas being near the centers of dense population (Figs. 1, 49, and 231). The producers, therefore, have the advantage of a near-by market and an adequate supply of labor. The importance of the labor supply is due to the fact that sugar beets require almost continuous cultivation from the time they are planted in the spring until they are harvested in September and October. Much of this work is done by the wives and children of men who are employed in a town or city not far from the fields.

Sugar Supply of the United States. The United States gets its sugar mainly from three sources. About a third comes from Cuba; about two fifths from our insular possessions—Puerto Rico, Hawaii, and the Philippines; the cane-growing district in Louisiana and our sugar-beet districts produce most of the remainder (Fig. 50). As Cuba and our insular possessions produce cane sugar, and as we get about three fourths of our supply from these sources, it is clear that we depend upon cane sugar rather than upon beet sugar. This means that while Europe is supplied chiefly with a middle-latitude product, the United States looks to low-latitude areas for most of its sugar. In each of these two great market areas, however, the two types of sugar are in competition. The product is the same, but the two plants are quite unlike and grow in very different environments.

How sugar production in United States territory is encouraged. Like many other countries, the United States considers it desirable

to have part of its sugar supply produced at home. For this reason, and also to furnish a revenue to the Federal government, a tariff is maintained on sugar. This means that a charge of about two cents is made for every pound of raw sugar shipped from a foreign country to an American port. Since cane-sugar planters in Louisiana or our insular possessions and beet-sugar growers in this country pay no tariff charge, they have an advantage in producing for the American market. Puerto Rican sugar, for example, comes into New York or Philadelphia free; Cuban and other foreign sugar pays a duty.

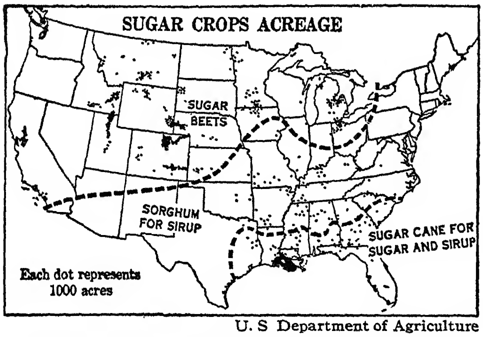

FIG. 50. Sugar crops of the United States

Beet-sugar production. The beet sugar consumed in the United States comes from four sections of the country: the California section, made up of a northern and a southern district; the plateau section in Utah and Idaho; the Great Plains section east of the Rocky Mountains; and the Great Lakes section of Michigan, Ohio, and Wisconsin (Fig. 50). The Great Plains section leads in production, the leading districts being the Arkansas Valley in Colorado and western Kansas, the South Platte Valley in Colorado and Nebraska, and the North Platte Valley in Wyoming and Nebraska. Except in the Great Lakes section the beets are grown largely under irrigation.

Sugar-beet culture represents a triumph for modern science and agriculture. As an important commercial crop, it goes back less than a century. Much study and many experiments were required before the industry became a success. First, varieties of beets with a high sugar content were found, and then, by selection and breeding, varieties much richer in sugar were developed. At the same time the chemical engineers were learning better methods of extracting sugar from the beets. This part of the industry is carried on in large factories located at convenient points in the producing districts.

In the producing districts the beet is highly regarded by the farmers, not only because it gives them a cash crop but also because

it is good for their land. The intensive cultivation of the crop during the growing season leaves the fields free from weeds. The deep roots open up the soil and help it to absorb and hold moisture. Furthermore, the beet tops and crowns cut off before hauling the beets to the factories, and the pulp and molasses turned out as by-products of sugar manufacture, make fine feed for cattle and sheep. All this makes for prosperous farming; and this fact, together with our desire to have part of our sugar produced within our borders, helps to explain the interest of our government in encouraging sugar production in this country.

Cane sugar from Louisiana. Louisiana contributes cane sugar to our markets. The principal producing area is on the alluvial plain of the Mississippi south of Baton Rouge and west of New Orleans. The soils are fertile, but the land is so low and level that in many places drainage is a problem. The growing season extends from March to October, the winter months having frost in some years. This means that early-ripening varieties have to be selected. The short growing season is offset to some extent by the long hot days and humid nights which occur in midsummer. At that time the days are longer in middle latitudes than in low latitudes, and thus in these summer days the cane has more daylight hours in which to grow.

Cane sugar from Puerto Rico. Exports of raw sugar, practically all to the United States, make up half the value of Puerto Rican exports. Cane is grown on both the northern and the southern coastal plains, but more on the latter. The northern side of the island has heavy rain from the northeast trade winds, but on the southern side the cane requires irrigation. Water for this purpose is brought from the rainy northern slopes by means of long canals and tunnels around and through the central mountain range. Although the soils in general are fertile, much fertilizer is used in growing the crop. This, with the necessary irrigation, means that on the whole the cost of producing sugar is rather high. The cane is harvested in the drier season, from December to April. Cutting commonly begins in January. Puerto Rico has a very large population for its small area and thus has a great abundance of labor. As compared with the Hawaiian and Philippine islands it has the advantage of nearness to our east-coast ports, and the further advantage of not having to pay tolls at the Panama Canal. Much of the Puerto Rican sugar enters the United States through the port of New York.

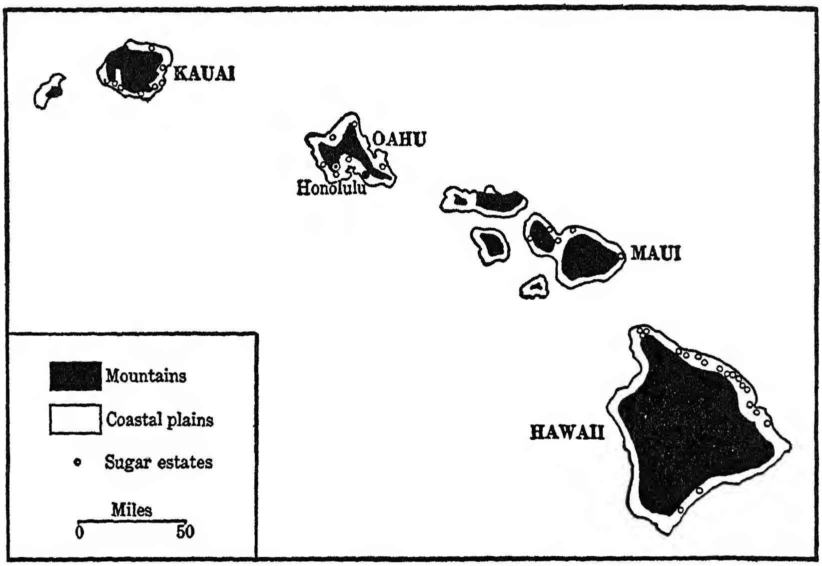

FIG. 51. Principal sugar estates in the Hawaiian Islands

Cane sugar from the Hawaiian Islands. Sugar was an important tie between the United States and the Hawaiian Islands even before the islands became a territory of this country. The cane is grown on large estates on the coastal margins of the central volcanic mountain masses which make up the islands (Fig. 51). In the northern islands most of the cane grows on the southern and western slopes, where dry, sunny weather gives the cane a high sugar content. Water for irrigation is brought by flumes from the rainy northeast-facing slopes of the mountains. In some places it is necessary to siphon water across deep valleys; in other places water is pumped from deep wells. The crop is grown with great care, expensive fertilizers are used, and the aim is to get high yields per acre. Much of the crop is shipped as raw sugar to San Francisco, where it is refined; but some raw sugar regularly is shipped to our eastern coast via the Panama Canal.

Why Cuba receives preferential treatment. Next to the sugar producers in United States territory, our tariff favors producers in Cuba. Under our tariff regulations Cuban sugar does not pay as high a duty as does sugar from Java, Brazil, or elsewhere. This special privilege is given to encourage our trade with Cuba and is part of a treaty between the United States and Cuba which gives each country preference in the markets of the other.

Why Our Study of Sugar Is Based on the Cuban Industry. The trade between the United States and Cuba, however, rests on a more logical basis than political preference. Fundamentally, it grows out of contrasted conditions in neighboring countries. The United States is a middle-latitude country with diversified industries and with a great need for sugar. Cuba is a low-latitude country chiefly interested in producing sugar for its big northern neighbor. In supplying that market Cuba has the advantage of being nearer to the United States than is any other cane-growing tropical area. For these reasons and because the trade between Cuba and the United States is the largest single movement of sugar in the world, the Cuban industry is taken as the basis of our study of this commodity.

2. *Sugar Cane and the Cuban Sugar Industry*

Sugar Cane a Tropical Product. Because sugar cane requires a year or more of continuous growth to reach maturity, cane-sugar production is at a disadvantage outside of tropical areas. In Louisiana, India, and a few other places, however, sugar cane is grown at the margin of the tropics in districts where frost may occur in winter. In these places it is harvested before it is fully ripe, for otherwise it would be damaged by frost. Since unripe cane does not contain as much sucrose as ripe cane, the sugar production per acre is lower in Louisiana than in such truly tropical areas as Cuba, Java, and Hawaii. In places still farther from the tropics the cane contains too little sucrose at the end of the growing season to make sugar production profitable. For this reason much cane grown in Texas, Alabama, and other southern states is used for sirup instead of sugar (Fig. 50).

Common Characteristics of Exporting Areas. Though sugar cane for local use is grown rather widely in the tropics, its commercial production is concentrated into a few areas. The principal areas exporting cane sugar are much alike in four aspects of their natural environment. In the first place, the land planted to cane is low and nearly level. The level surface is, of course, an advantage in planting, cultivating, and harvesting the crop. In the second place, all the exporting areas have a fertile soil. In the third place, the exporting areas lie near the sea, the principal areas being islands. Finally, in the principal exporting areas the year is divided into a rainy and a dry season, although the length of the dry season varies from place to place.

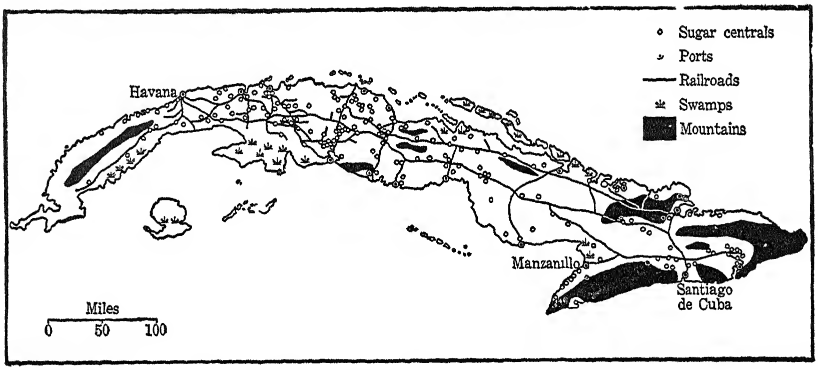

FIG. 52. Sugar centrals in Cuba

Why Sugar Dominates Cuban Commercial Activities. Sugar dominates Cuban industry and is ever present in Cuban affairs. Tobacco is a staple product; and bananas, pineapples, and such early-season vegetables as tomatoes are exported to the United States. Iron, copper, and manganese are the major mineral resources. The iron deposits are large in amount; but not much ore is mined at present, because most of the deposits are owned and held in reserve by American steel interests and the United States still contains much iron ore. Sugar accounts for more than 70 per cent of the value of Cuban exports, and Cuba produces a fourth of the world's export sugar.

The pre-eminence of Cuba in the sugar trade rests on a number of advantages in producing and marketing the crop. Two of these —the preferential treatment of Cuban sugar in the United States and the nearness of Cuba to its principal market—were stated in section 1. The other advantages (seven in number) and one disadvantage you will find in this section.

A Large Area Suited to Crops. One of the reasons for the prominence of sugar cane in Cuba is the large area on which crops may be grown. In this respect Cuba stands almost alone among tropical islands; for most of them, such as Puerto Rico, the Hawaiian Islands, and Java, have a mountainous core unsuited to agriculture. Even in Cuba one observes land too steep, too wet, or with soil too thin or poor for cultivation (Fig. 52); but it is estimated that more than half of Cuba's 44,000 square miles is suitable for the cultivation of sugar or other crops.

Modern Machinery and Efficient Management. In general, the sugar industry of Cuba has the advantages of modern machinery and

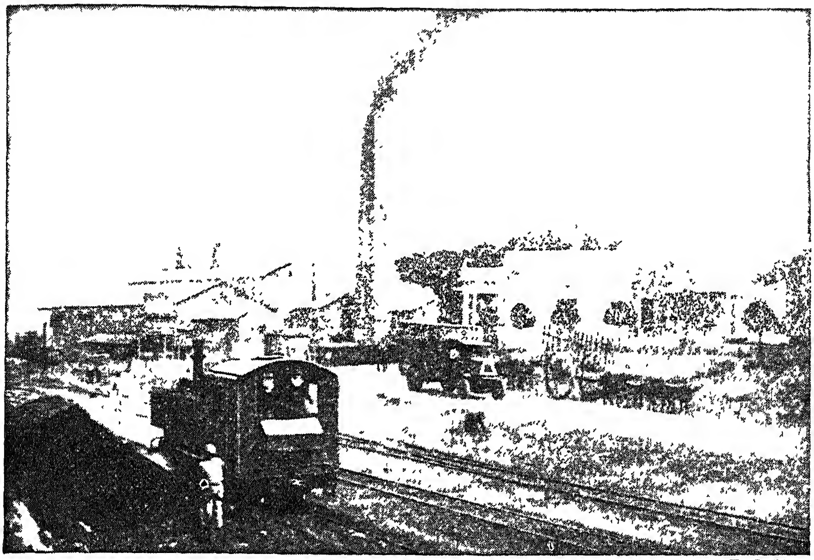

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FIG. 53. *A sugar central west of Havana, Cuba. Cane is brought to it by rail, by trucks, and by oxcarts*

efficient business management. In the long-settled western part of the island, cane from a group of plantations is delivered to a centrally located factory known as a "central," where the cane is crushed and the juice turned into raw sugar (Fig. 53). The central, equipped with modern machinery, obtains a larger yield of sugar from the cane than do the primitive devices used in many areas. The cost of building and operating such a plant, however, lies entirely beyond the finances of an ordinary planter, and thus a central is profitable only where there is an acreage of cane large enough to keep it in operation for some months. In the newer sections of Cuba, particularly in the eastern part of the island, much of the sugar is produced by big companies which own both land and central.

A Representative Estate. Central B——, near Manzanillo in southeastern Cuba, illustrates the size and equipment typical of the big plantations. It belongs to a company founded by an English family who came to Cuba in the 1880's. It consists of 27,000 acres, and the mill has a yearly grinding capacity of 300,000 bags. It is located at a wharf, so that raw sugar is loaded on the ships directly from the mill. Cane for the mill comes both from the estate itself and from other plantations located along the company's railroad. There are, in fact, upward

of 60,000 acres in the cane-growing area tributary to this mill. (How many farms would this make according to the average size of farms in your county?)

The estate represents a large investment in addition to the land and the central. The railroad which delivers cane to the central, for example, is 45 miles long and is equipped with 24 cane-loading stations, 300 cars, and 9 locomotives. It is under the control of a train dispatcher, as are the railroads of the United States. The field equipment on the company's property includes 90 cane carts, 1000 oxen, 900 brood cattle, 90 horses, and 80 mules. During harvest upwards of 3000 men are on the pay roll. Some of these men live on the estate, and others live in near-by villages. In many instances extra labor is brought in under contract for the busy harvest season, and living quarters for these temporary hands must be provided. The executive who is responsible for the success of the company has had long experience in the sugar business, and holds a position more nearly comparable to that of the superintendent of a great factory than to that of a farmer.

Planting the Crop. Two methods of planting sugar cane are practiced in Cuba, the choice of method depending on whether or not the land has been cultivated previously. If the land has been cultivated, it commonly is burned over and then plowed, harrowed, and laid out in shallow trenches about six feet apart (Fig. 54). Cuttings of the stalk of mature cane are placed about three feet apart in the trenches and then are covered with soil. If the land never has been cultivated, it must be cleared before planting can commence. No plowing is done on new land; for many stumps and roots remain, even after the land is burned over. Instead, holes are punched in the ground with a heavy ironshod pole. Cuttings are dropped in the holes and covered. In no competing area are the preparing of the land and the planting of the crop more simple than in Cuba. The low cost of planting the crop, therefore, is another advantage which Cuba enjoys in producing sugar.

Fertile Soil Yields Many Crops from One Planting. Cuban sugar-growers not only plant more cheaply than their competitors, but they meet this expense less frequently than is necessary in most other cane-sugar areas. Sugar cane, like the banana, has a perennial rootstalk. After the cane is cut new shoots spring up from this rootstalk and produce a second crop, known as a "ratoon" crop. Under favorable conditions this operation may be repeated several times. Thus, at

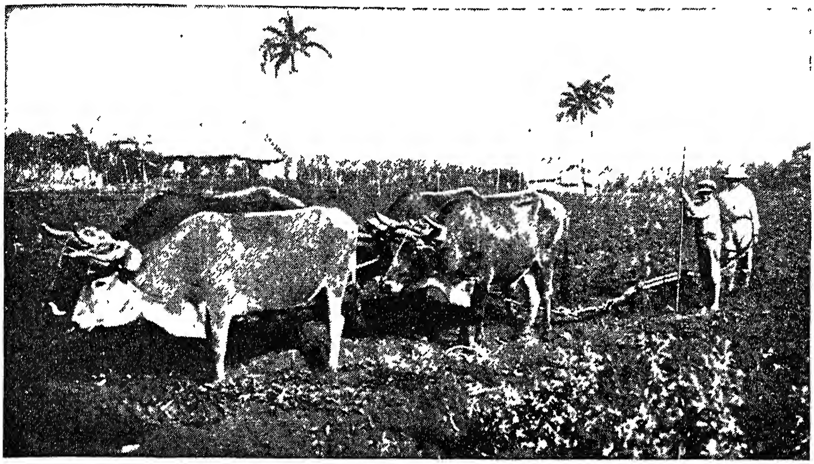

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FIG. 54. Plowing for the planting of sugar cane in Cuba

Central B—— and on many other Cuban estates, eight to ten ratoon crops are obtained from one planting. The fields then are pastured for four or five years, after which they may be plowed and replanted. Here lies one of the advantages in Cuban production. In Louisiana there is only one ratoon crop; in Hawaii only two ratoon crops commonly are grown; and in Mauritius it is not common to grow more than three ratoon crops. It is evident, therefore, that the highly fertile soil of the island is an important asset for sugar-cane production in Cuba.

Cultivating the Cane. In a warm humid climate where frosts never occur, weeds are a big problem. In areas that have been cleared for some years cultivators are driven between the rows of young cane to keep down the weeds. In newly cleared fields where roots and stumps interfere with the operation of cultivators, the weeds are cut down with hoes or machetes. The thick foliage of the sugar cane shortly produces enough shade to aid in controlling the weeds (Fig. 55). In the newly cleared lands weeds are not much of a problem, but on the older plantations considerable time and expense are required to eliminate them.

Rainfall Adequate in Amount. Cuba is fortunate in having a rainfall adequate for sugar cane; whereas in the Hawaiian Islands, India, and many other producing areas, irrigation adds to the work and expense of sugar-cane culture. In Cuba the abundant rains from April

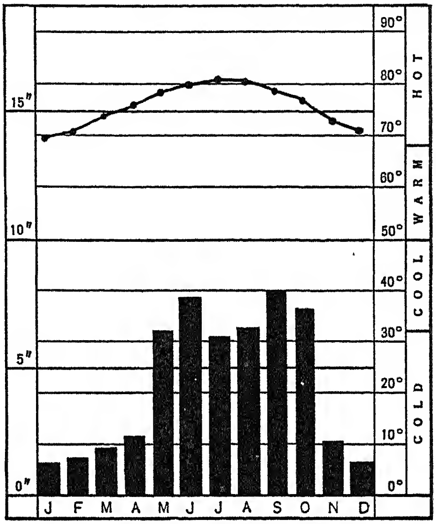
Philippine Bureau of Agriculture

FIG. 55. A stand of sugar cane in the Philippine Islands

to November occur during the period when the crop needs much moisture, and some rain falls in the other months (Fig. 56).

Dry Season Favors Harvest. The Cuban sugar harvest takes place during the drier season, from November to May (Fig. 56) ; for then the sugar content of the mature cane is highest. The cane contains little sugar during its early growth, because then the plant food is used in growing stalks. After twelve to fifteen months the cane, influenced by the drier weather, ripens and attains its highest sugar content. If it is permitted to become overripe, it dries up and the sugar content is lowered. By cutting the cane at the time when the sugar content is highest, more sugar is obtained from an acre than would be secured if the cane were cut earlier or later. Harvesting during the dry season has another advantage; for then it is practicable to get on the land with the heavy oxcarts in which the cane is hauled to the railroad or to the central (Fig. 57). In low-latitude areas where there is little or no dry season, as in the banana and cacao-growing districts, sugar cane is not a profitable crop. The yield per acre is low, and the harvesting of the crop presents great difficulties. As might be expected, therefore, sugar cane is grown in the tropical areas which have both a rainy and a dry season.

Harvesting Cane a Laborious Task. Harvesting a tall, heavy crop like sugar cane is a laborious matter. Anyone who has made hay knows that to pitch hay on a wagon or into a mow is hard work. Yet from an ordinary hayfield only two or three tons of hay are cut, whereas on a Cuban acre from fifteen to forty tons of cane are produced. The average height of the cane is twelve feet and the average weight per stalk is about six pounds (Fig. 55). Sugar cane, therefore, is a heavy crop to handle. The cane is cut by hand close to the ground, and the tops and leaves are trimmed off (Fig. 58). Then the cane is cut into lengths from three to four feet long and thrown into piles. Afterward the cane is loaded into oxcarts and hauled to the railway or to a central (Fig. 59). All these harvest operations call for labor.



Elevation above sea level, 15 feet
Average annual rainfall, 52.3 inches

FIG. 56. Temperature and precipitation of Cienfuegos, Cuba

Scarcity of Labor a Disadvantage. The heavy work of the harvest season calls for many men who are not needed on the plantations during the rest of the year. Where are these workmen found? This is one of the big problems of the industry, for Cuba has less than 4,500,000 people. The problem is solved, at least in part, by bringing in laborers from other countries. After the harvest is finished, these men return to their own country. Large numbers come from densely peopled Jamaica, and at times some have come from Spain. The scarcity of labor puts Cuba at something of a disadvantage as compared with competing countries; for it has an average of only 90 persons per square mile, whereas there are 214 in Jamaica, 475 in Puerto Rico, and 671 in Java. As a result, the cost of harvesting cane is somewhat higher in Cuba than in the other areas.

The Central: Its Functions and Location. The methods employed in manufacturing sugar from the cane require, as already noted, an

James Sawders

FIG. 57. Hauling freshly cut sugar cane to a central in Cuba

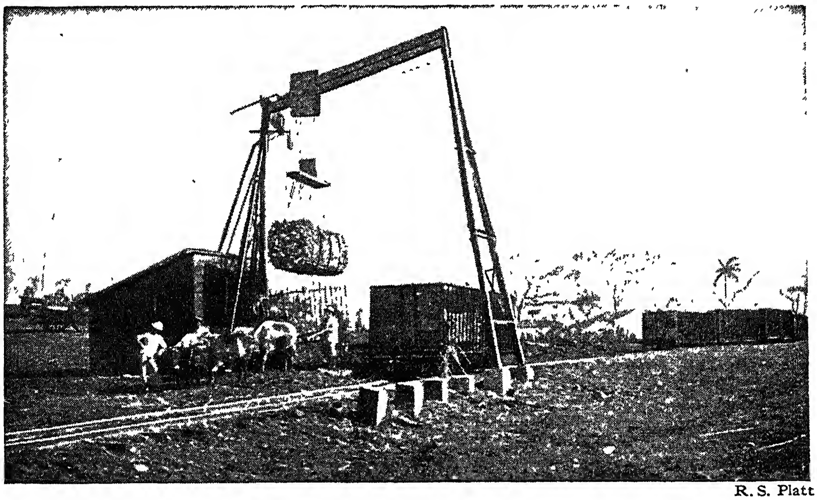
elaborate plant which is too expensive for any but a large company to operate (Fig. 53). The juice is extracted by running the cane through successive sets of rollers. The juice is then purified, and about 75 per cent of the water is evaporated from it by boiling. Subsequently the raw sugar is concentrated, crystallized, dried, and stored in jute bags to await shipment.

Raw sugar is manufactured near the cane fields; for the cane will spoil if not crushed within a few days after cutting, and it would be expensive to haul such a bulky crop a long distance. In many instances the central, as the name implies, is near the center of the estate, thus reducing the haul to a minimum.

The Shape and Coast Line of Cuba Favor Export. In the matter of getting sugar to the seaboard for export, Cuba is fortunate. Because of the long and narrow shape of the island, no point in Cuba is more than 40 miles from the sea. Moreover, the Cuban coast is cut by bays, and these bays furnish good harbors. In fact, sugar is shipped from more than twenty ports (Figs. 52 and 60). In addition, Central B—— and some other centrals load steamers at their own docks. This fact makes a great difference in the profits of the industry; for authorities state that companies operating in the interior of the island pay nearly as much for getting their sugar to a port as they pay for ocean freight from Cuban ports to New York.

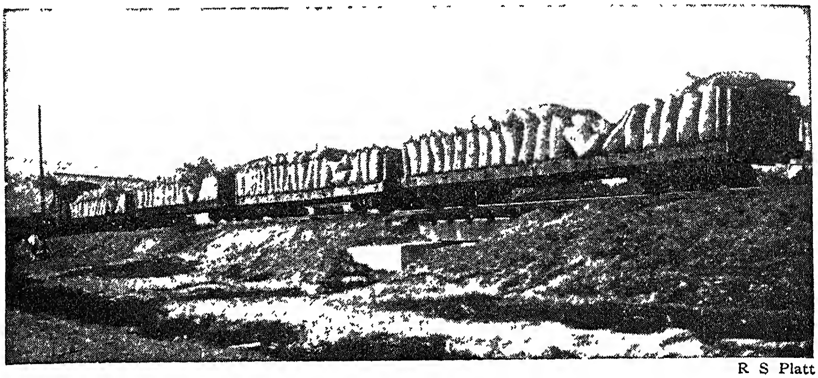
R. S Platt

Fig. 58. Cutting sugar cane with a machete



R. S. Platt

Fig. 59. Loading cane at a railroad with apparatus made in an American factory



R S Platt

Fig. 60. Bags of raw sugar en route from central to dock

Cuban Ports and Their Trade. During the grinding season many ships visit Cuban ports to load sugar for the sugar-importing ports in the United States and Canada (Fig. 61). Although some of these vessels bring lumber from our Gulf ports, the greater number come in ballast. Most Cuban ports are primarily sugar-shipping points, the import business of the island being handled through Havana, which also is the principal jobbing and wholesale center.

Sugar-Refining. The sugar which leaves a Cuban central is not the clear white granulated sugar with which we are familiar. Instead, it is raw sugar, a brownish mass with a strong molasses odor; and several complicated processes are required to change it into the sugar sold in our stores. The factories which perform this work are known as refineries.

Why sugar is refined in consuming regions. Raw sugar is refined in the region of consumption rather than in the region of production. Thus, Cuban, Hawaiian, and Puerto Rican raw sugar is refined in the United States, and the Javan sugar consumed in Great Britain is refined in British ports. This practice is followed because (1) refined sugar should be moved and sold as soon as practicable after its manufacture; (2) refined sugar rapidly absorbs moisture, and in transit by ocean from the tropics to middle-latitude markets would probably become lumpy or caked and thus be unfit for sale; (3) a big middle-latitude refinery, drawing its raw sugar from several producing districts and thus running all the year, can introduce economies not possible for a tropical plant depending on a single producing district and obliged, therefore, to discontinue operations when the local grinding

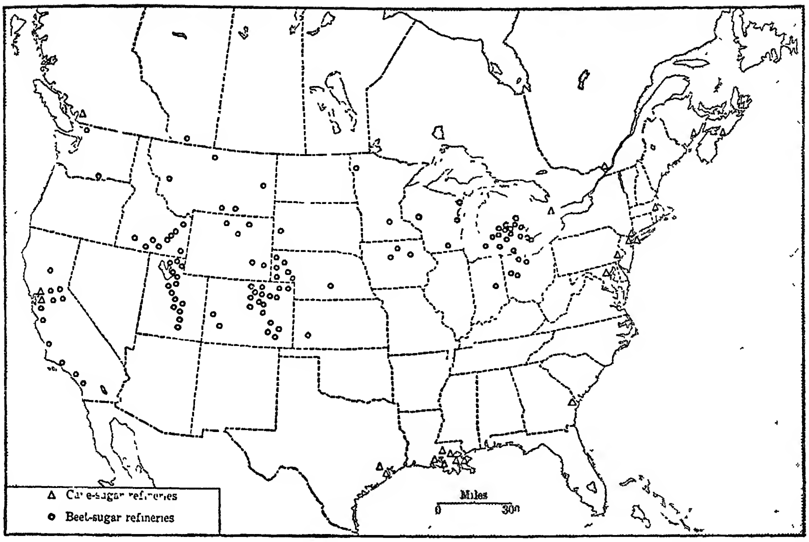


Fig. 61. Cane-sugar refineries and beet-sugar factories in the United States and Canada

season is over; (4) the commodities required in refining and packing sugar, such as bone char, lime, acids, filter bags, cotton cloth, barrels, boxes, and machinery, as well as coal for fuel, are assembled more cheaply in a cosmopolitan middle-latitude port than in most tropical exporting points.

Refineries located at the seaboard. In the importing countries practically all the refining is done by a few large refineries located in seaboard cities. Clearly, it is more economical to ship refined sugar to interior points than to ship the heavier and bulkier raw sugar. There are nineteen cane-sugar refineries in the United States. Most of these are in Atlantic ports (Fig. 61). Nearly half the cane sugar imported into the United States is refined within the limits of the port of New York. Boston, Philadelphia, Baltimore, and Savannah also import and refine sugar. New Orleans refines both sugar grown locally and imported sugar. San Francisco is the only important refining center on the Pacific Coast. It draws raw sugar from the Hawaiian Islands and the Philippines. In Canada the big refineries are in Halifax (Nova Scotia), St. John (New Brunswick), and Montreal (Quebec). The big plants located in London and Liverpool show that British refiners also choose the principal ports for their business.

QUESTIONS

1. Of what importance are the United States, Western Europe, Japan, and China in the world's sugar trade?

2. Which produces more sugar, the Old World or the New World? Which produces more cane sugar? Which produces more beet sugar? Which continent produces most beet sugar?

3. Which ranks higher in sugar production, the Northern or the Southern Hemisphere? Explain.

4. Where does the United Kingdom get its sugar?

5. From what areas does the United States secure its supply of cane sugar? From what areas does it get beet sugar?

6. Why does our Federal government maintain a tariff on sugar?

7. What did science contribute to the sugar-beet industry?

8. What is a by-product? What by-products are obtained in the manufacture of beet sugar?

9. Which has a climate better suited to the growth of sugar cane, Louisiana or Cuba? Explain.

10. Where is sugar cane grown in the Hawaiian Islands? Why there?

11. Name the steps in producing Cuban sugar from the time the land is cleared until the raw sugar is ready for export.

12. During what months is sugar harvested in Cuba? Why not during the rest of the year?

13. How do the Cuban sugar estates get enough laborers to harvest the sugar crop? Is this necessary in Puerto Rico and Java? Explain.

14. Describe the distribution of sugar centrals in Cuba (Fig. 52).

15. What conditions favor the export of raw sugar from Cuba?

16. Why is raw sugar not refined before it is shipped to the United States and Canada?

17. Name the principal cane-sugar-refining centers in (1) the United States and (2) Canada. What have all these cities in common?

EXERCISES

1. *Sugar climates*

Figure 56 represents conditions in a sugar-cane district of Cuba; Figure 233, p. 420, represents conditions in a sugar-beet district of Western Europe. Compare the climates of Cienfuegos (Cuba) and Brussels (Belgium) by answering the following questions: (1) How do the summers of the two places differ, as indicated by average temperatures for July? (2) How do their winters differ, as

indicated by average temperatures for January? (3) If a month with an average temperature of 40° F., or higher, is warm enough for plants to grow, during how many months can crops grow in the area about Brussels? (4) During how many months can they grow in Cuba? (5) Which area gets more rain in June and July? (6) Which gets more in December and January?

2. *Graphic presentation of sugar production*

a. Make a bar graph to show the production of raw cane sugar in the leading ten producing countries. Make a similar graph for the leading ten countries producing raw beet sugar. Let each space of your graph paper represent 500,000 tons of sugar. Color red the bars showing cane sugar and color blue the bars showing beet sugar.

b. Write a paragraph under the title "Conclusions about the World's Sugar Crop." Include answers to the following questions: (1) Which is larger, the world's beet-sugar crop or its cane-sugar crop? (2) Which country produces most cane sugar? (3) Which produces most beet sugar? (4) Which of these two produces the larger crop? (5) What beet-sugar producer also grows some sugar cane?

3. *Location of Cuba*

Someone has claimed that Cuba is the best-located tropical island in the world. Give three arguments in favor of this statement. In the first, compare the distance from Cuba to New York, the largest American refining center, with that from other islands producing large quantities of cane sugar. In the second statement, compare the advantages of Cuba with those of Java in supplying the London market with cane sugar. In the third statement, name six other refining centers to which Cuba is nearer than any other large cane-producing country.

CHAPTER IX

COFFEE: A PRODUCT OF TROPICAL UPLANDS

1. *The Coffee Industry and the Brazilian Coffee Region*

Demand and Supply. In terms of both consumers and producers, interest in coffee is confined largely to countries facing the Atlantic Ocean. Europe and the United States are the major consuming areas, each taking nearly half the world's imports. Most of the producers live in Tropical America, where Brazil and the Gulf and Caribbean countries are the major producing areas. This concentration of demand and supply about the Atlantic is surprising in view of the fact that the original home of the coffee tree was in Abyssinia and that the early commercial developments were in Arabia and Java.

Rank of Brazil among coffee-producing areas. Brazil produces more than half the world's export coffee. The rest comes from many small areas scattered throughout the tropical belt that encircles the earth. The Gulf and Caribbean Lands, Tropical Africa, Tropical Asia, and Hawaii all take part in producing the world's supply (Fig. 62).

The major areas selling coffee in competition with the Brazilian crop are in the highlands of the Gulf and Caribbean Lands. More than a dozen countries in this region grow coffee. Moreover, their coffee is of high quality and sells at good prices in the United States and Europe. Colombia produces nearly half the crop of the Gulf and Caribbean Lands and ranks next to Brazil among coffee-producing countries. It contains about a dozen districts, each centering about a city or town in one of the north-south valleys of the Andes (Fig. 62 and Plate IV).

About 15 per cent of the world's export coffee is grown in tropical sections of Asia and Africa. The crop of Java, the only major producing area of the Orient, is famous for its quality. It is grown both on estates owned by Europeans and on little patches cultivated by natives. In some mountainous localities of Tropical East Africa coffee grows wild, and native farmers long have cultivated it for local use. Now Europeans are growing coffee for export in British and Belgian sections of the volcanic upland about Lake Victoria, and also in French-owned Madagascar. The coffee export of East Africa

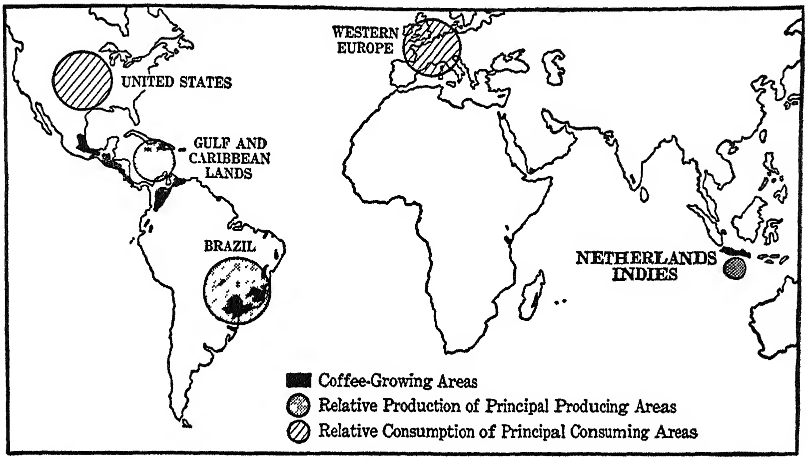


FIG. 62. Principal coffee-producing and coffee-consuming areas of the world

has more than doubled since the middle 1920's and now surpasses that of Java in quantity.

Importance of coffee in Brazil. "Coffee is king" in Brazil; but only about one acre in five hundred actually is planted to coffee trees, and only the southeastern part of the country grows coffee on a large scale. Yet the crop of this relatively small area has much importance for the prosperity of Brazil as a country. Coffee culture has attracted thousands of settlers into a former wilderness, has led to the building of roads and railways, and has brought many ships to Brazilian ports. Coffee usually accounts for about two thirds of the value of all products shipped from Brazil to foreign countries. Therefore the business of merchants in the cities depends to a large degree upon the success of the coffee trade. The taxes collected in the coffee region amount to more than those from all the rest of the country. Hence when the coffee trade prospers, the Brazilian government has funds for building roads and making other public improvements. When coffee-growers and coffee-exporters meet hard times, the government lacks funds to pay even its ordinary expenses.

The coffee cities and the coffee region. The three major cities of Brazil are deeply interested in the coffee trade. Santos and São Paulo owe their growth mainly to coffee, and coffee adds much to the business and wealth of the national capital, Rio de Janeiro. The principal coffee-growing areas lie on the upland back of these cities, extending

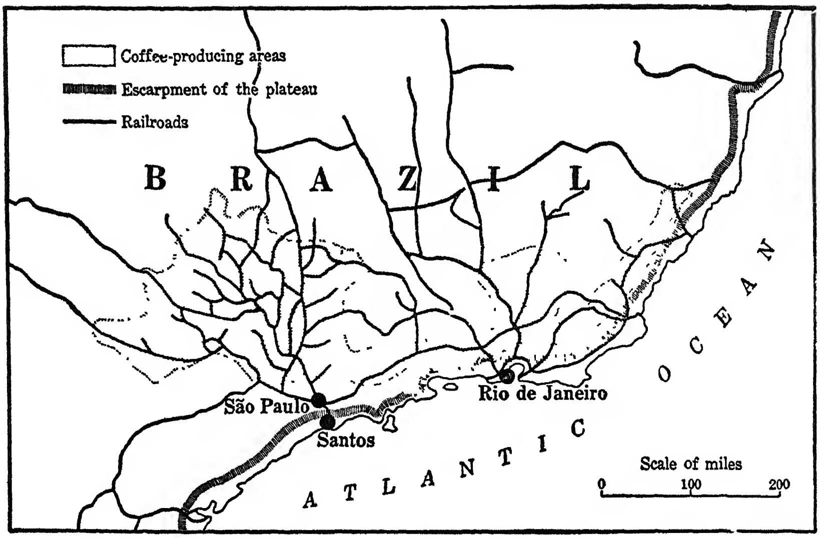


Fig. 63. Coffee-producing area of Brazil

inland for a distance of from 250 to 300 miles (Fig. 63). They do not reach the sea; for the Brazilian coast is bordered by a narrow strip of lowland unsuited to the crop. Santos and Rio de Janeiro, the principal coffee ports, lie on the lowland. Back of the narrow plain is a steep slope leading to a broad upland, or plateau. This upland extends inland for many miles, and on its broad, rolling surface the coffee plantations are developed at elevations of 2000 to 3000 feet.

São Paulo, the commercial center of the coffee region, lies between the principal coffee area and the seaward margin of the plateau. It is the junction point where the numerous railroads of the coffee country connect with the line leading down the steep escarpment to Santos (Fig. 63). Seventy years ago São Paulo was a small town on the edge of a wilderness. Now it has more than a million inhabitants and ranks next to Rio de Janeiro among the cities of Brazil. It owes its rapid growth to the coffee industry. Its fine residential sections contain the city homes of wealthy coffee-planters, its wholesale stores sell to merchants in the towns and villages of the coffee country, and its factories produce cotton goods and other commodities needed on the plantations.

The commercial relation of Rio de Janeiro to the coffee country is principally that of an importing, wholesale, and shopping center,

though it is also an important coffee port. It receives most of the crop grown in the smaller coffee areas near the edge of the upland, as well as some shipments from the area back of São Paulo; but Rio de Janeiro is the principal importing port of the country. Ships bringing foreign goods for use in São Paulo and the coffee country generally unload their cargoes at Rio de Janeiro, even though they may be going to Santos to take on coffee.

Coffee region a market for neighboring areas. The coffee region, containing about a fourth of all the people in Brazil, forms an important market for foods produced in neighboring areas. Its cities purchase sugar and tropical fruits from the near-by coastal lowlands. The beef supply comes largely from the plateau grazing lands north and northwest of the coffee region, where the dry season is long and severe. In this great empty region with no railways and very few farms, cattle graze on unfenced land. At the end of the rainy season many herds, each consisting of from 1000 to 3000 cattle, move toward the margin of the agricultural area. There the cattle are sold to stockmen who keep them on rich pastures for a number of months and then sell them to butchers or to the agents of companies with packing houses in Rio de Janeiro or São Paulo.

The Brazilian states south of São Paulo contribute middle-latitude products to the food supply of the coffee region. They lie as far from the equator as does Florida, and they contain, moreover, a belt of plateau country between 2000 and 3000 feet above sea level. Farms on the upland produce corn, and a large part of the crop goes to feed hogs in order that the coffee-growers may have pork and lard. The principal shipments of wheat come from the southernmost Brazilian state, where snow sometimes falls in winter. Dairy farmers in fertile lowland areas produce butter, and wine is produced by Italian settlers in protected valleys.

2. *Why Brazil Leads in Coffee Production*

Brazil's leadership in coffee production is not accidental. Individual producers have worked hard to make the industry succeed, and so have the merchants who are interested in the coffee trade. The government also has been eager to pass laws that will help and not hinder the business of growing and selling coffee. The combined efforts of the government and the planters have been successful in

gaining supremacy in the coffee trade because Brazil has natural advantages for coffee culture which no other country can equal. What are those advantages?

Extensive Area Suitable for Coffee. The Brazilian upland surface is one of the chief assets of the coffee industry. Coffee culture clings to the humid uplands of tropical countries; but in most parts of the tropical belt, land at suitable elevation is found only in narrow strips on the slopes of mountain ranges. In contrast, the Brazilian coffee groves cover hill after hill like an enormous green blanket (Fig. 64). On the uplands of São Paulo and neighboring states, moreover, there still is a vast expanse of wild land suitable for coffee.

The large area of level land suitable for coffee permits cultivation on big estates by cheap methods. This fact is illustrated by the D—— estate, which covers an area as large as an American township. Its trees are numbered in millions, and the people of twenty villages are employed in cultivating, pruning, and harvesting coffee. The plantation was established years ago in the wilderness, and before any coffee was produced the planter laid out the villages and built houses for the small army of laborers required. Schools, churches, and hospitals are provided, and the estate maintains stores and bakeries to supply the laborers with food and other necessities. A private railway connects the plantation headquarters with the nearest station on the main line, 15 miles away. The equipment of the estate includes broad cement floors for drying coffee (Fig. 64), factories with machinery for hulling and sorting, and wagons or tram lines for hauling the coffee to the factories. There is a supply of cultivators to be used between the rows of trees; for the groves are kept free from weeds, and the coffee lands of São Paulo, like the cornlands of our Middle West, are level enough to be cultivated by machinery.

Rich Soil Gives Large Yield. Travelers in Eastern Brazil learn to watch for the brick-red soil, the *terra roxa*, which is widely distributed there. When they see it, they say, "Now we shall be coming to the coffee groves." This *terra roxa* is the soil of the coffee districts. It is a fine clay, rich in humus from the grass and scattering forest which it supported before the planter took possession. It lies upon a deep gravel subsoil and combines good drainage with remarkable fertility. The richness of the virgin soil accounts for the large yield during the first ten or fifteen years after the plantation begins to bear fruit. The system used in establishing a new plantation is arranged

Ewing Galloway, N.Y.

FIG. 64. A partial view of one of the coffee plantations near São Paulo, Brazil. The plantation headquarters are in the little village in the distance. In the foreground are the homes of some of the plantation workers

to take advantage of the virgin richness of the soil, and it works out to the profit of both planter and laborers.

Importance of virgin soils. Plantations are in most cases established by co-operation between the planter, who owns the land, and the community of laborers, who do the work. In return for their labor in clearing the land and planting the coffee trees, the laborers have the privilege of occupying, rent free, the cottages built for their use. They have the privilege also of planting crops between the rows of trees. The rich soil gives a generous yield of corn, potatoes, and beans, supplying the villagers with their staple foods and also with feed for their pigs and poultry. About the third year after planting, the coffee trees begin to bear—a little at first, more the fourth year, and a fair-sized crop the fifth year. These first crops also belong to the laborers and are the final reward for their work. The proprietor now takes possession of his fine new grove, which is likely to yield from three to five pounds of coffee per tree for a number of years. In many instances the laborers have saved enough to make them comparatively well-to-do citizens. Thus, because of the rich virgin soil, both proprietor and laborers reap profit within a few years after clearing the land. The profit, however, varies with the price of coffee, and in recent years coffee prices have been low.

Problem of declining yield in older areas. The declining yield on middle-aged or old plantations presents serious problems in the coffee region. After the virgin fertility of the soil is exhausted, the yield falls to one pound per tree or even less. The expense of production per acre remains nearly as great as when the yield was larger. Consequently, profits fall off, and planters declare that they cannot make expenses unless the price of coffee rises. Meanwhile new plantations are being established farther from the sea, extending cultivation into the wilderness as fast as railway transportation is offered.

The low yield in older districts is particularly serious because there, where the growers have had long experience and use careful methods in cultivating, harvesting, and curing the crop, a finer grade of coffee is produced. Many of the pioneer farmers lack experience, and in many sections they cannot get enough help at harvest time to care for the crop properly. Consequently much poor coffee comes from the newer districts. In recent years Brazilian exporters have been able to sell the better grades of coffee in foreign markets, and the poorer coffee has piled up in the warehouses.

Many attempts have been made to solve the problems of the coffee industry. Some planters have turned to other crops, particularly cotton. Some are trying to get better yields by using commercial fertilizer or by combining stock-raising with coffee culture so as to have a supply of manure for their land. The government has tried to keep the price of coffee up by regulating the quantity exported. For several years it bought coffee from the growers and destroyed great quantities of the poorer grades that could not be sold at fair prices. This plan seems to have had some effect on prices, but rising prices have encouraged the planting of new groves in the Gulf and Caribbean Lands. Meanwhile the production of low-grade coffee in certain pioneer districts of Brazil continues to increase.

In the last few years the government has turned its attention to the improvement of quality. It prohibits the sale of the lowest grades and is trying to educate the growers particularly in the newer districts. It operates factories in these districts to hull and cure coffee from the plantations. In order to show the growers what can be done through better methods of curing, the factories are for a while treating coffee free of charge.

Climate Favors Production at Low Cost. The Brazilian coffee region holds its leadership because it produces a large crop at low

cost; and climate, as well as surface and soil, contributes to this result. Three characteristics of the climate are of particular significance—a moderate temperature, a sufficiency of rainfall, and a comparatively dry winter season.

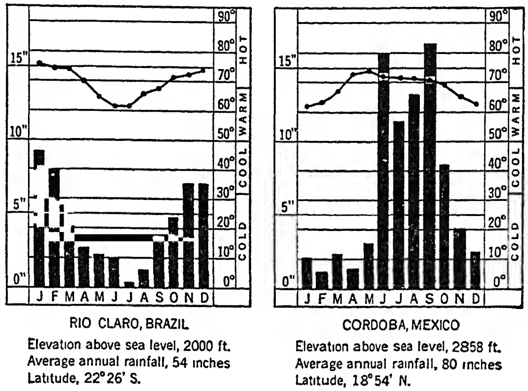


FIG. 65. Temperature and precipitation at Rio Claro, Brazil, and at Cordoba, Mexico. Cordoba is in a coffee-producing section of Mexico. Explain the contrast in the time of greater heat and rainfall at the two stations

Moderate temperature decreases necessity for shade. The moderate temperature of the São Paulo upland is one of the advantages of the region (Fig. 65). Though coffee thrives near the equator, the intense heat of the vertical sun injures the trees if they are exposed to its full force. Therefore, in most coffee-growing areas trees are planted to shade the coffee trees. As the Brazilian coffee district lies near the cooler margin of the tropical belt, it is not necessary to shade the coffee there except in the case of young trees in the nurseries. Thus the moderate temperature helps to keep down production costs.

Humid conditions decrease likelihood of disease. The coffee trees of Brazil have been remarkably free from disease, and the climate is responsible, in part at least, for this desirable condition. Coffee trees need moisture all the year, for they have no season of rest. From nine to ten months are required to mature the fruit after the blossoms appear. The necessary moisture is provided in São Paulo by an annual rainfall of about 60 inches. Approximately three fourths of the rain falls in the six months from October to March, inclusive; therefore moisture is most abundant in summer, when the fruit is developing (Fig. 65). Rains become less frequent in April, when the fruit is ripening; but there are some showers in every month, and the deep soil and subsoil long remain moist. In addition, heavy dews are common during the winter dry season, and night fogs frequently drift in among the coffee trees with a beneficial effect. These favorable moisture con-

ditions make possible a sturdy, vigorous growth. Coffee trees which are weakened by long exposure to drought or which grow in poorly drained soil are easy prey to disease; but the vigorous health of the São Paulo groves enables them to resist disease. Hence, owing to the favorable climate, the expenses of the São Paulo planters for fighting coffee diseases are comparatively small.

Dry season favors harvest. The winter dry season of São Paulo favors the annual coffee crop at three critical stages. It is an advantage at blossomtime. The trees bloom repeatedly from July until October; but the blossoms which produce the principal crop open in August and September, that is, in the latter part of the dry season. At that time of year the mornings are cool, the noon hours warm, and the skies gloriously clear. These are the best of conditions for blooming coffee trees. Untimely rain would cause the blossoms to fall.

The dry season facilitates the gathering of the crop. Harvest begins in May with the gathering of the coffee which has fallen from the trees. Picking then begins and is ordinarily finished by August or September. Whole families from the plantation villages work together in the fields. Canvas is spread under the trees to catch the coffee as it falls. Children strip the lower branches, while the men climb on ladders to reach the higher parts of the trees. Women and old men rake up the coffee and sort out the leaves, twigs, and stones. Fair weather is an advantage to the pickers, for they are paid according to quantity, and rainy days would mean idleness. Fair weather is important to the planter too, for wet weather would mean coffee injured or entirely spoiled by lying on the wet ground.

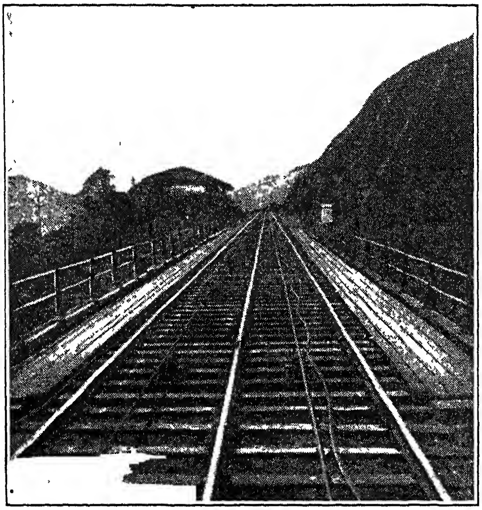
In preparing the coffee for market the dry winter season is worth millions of dollars to the industry. Before the berries are ready for sale they go through various processes to remove the four wrappings which enclose the coffee beans, and then the beans must be dried. Because of the bright weather the Brazilian planters are able to dry their coffee in the sun instead of using expensive artificial driers (Fig. 64). The drying floors are blackened so that they will absorb as much heat as possible from the sunlight; but, even so, it sometimes takes two months for the coffee to dry. When occasional showers come up, the men cover the coffee with canvas. One year the months of September and October were so rainy that much of the coffee sprouted before it could be dried. This unusual season emphasizes the advantage of favorable weather enjoyed in ordinary years.

Access to the Sea. Excellent growing conditions would be of little benefit without effective means of moving the coffee to the coast, for practically the whole crop is exported. As already noted, the coffee region has an extensive railway system which reaches all the plantation districts, and large producers have established branch lines to their estates (Fig. 63). Government-owned warehouses located at important junction points store the coffee, sometimes for many months. In this way a steady stream to the seaboard is maintained in spite of the fact that harvest is crowded into four or five months. At Santos and Rio de Janeiro special loading machinery transfers the coffee from car to ship.

Problems of transportation to the seaboard. The railway system of the coffee region, particularly the 50-mile line from São Paulo to Santos, marks a notable triumph over difficulties of the natural environment. On the plateau, although numerous streams and ranges of hills must be crossed, the engineers met only customary problems of construction. Between São Paulo and Santos, however, the steep slope from the plateau to the coastal plain proved a formidable barrier. No valley route leads down this slope; for the streams which rise near the eastern margin of the plateau flow down its long, gentle westward slope and eventually reach the Paraná River. The sea-facing slope of the plateau consists of a granite wall, or escarpment, cut only by the steep and rocky gorges of a few short streams. This escarpment is so abrupt that the upland carried on little business with the coastal plain until the railway was constructed. Formerly the few farmers on the upland could send their produce down to Santos only by pack train over a poor, zigzag road built more than a hundred years ago. The use of wheeled vehicles was out of the question, for the grades were so steep that the mules frequently slid on their haunches from one turn to the next. This bold escarpment, therefore, offered a challenge which had to be met before the people of São Paulo could grow coffee profitably.

Conquering the escarpment. Eventually the escarpment was conquered by the science of engineering. From the base of the escarpment a short distance out of Santos, the railway climbs to an elevation of 2600 feet in seven miles (Fig. 66). The ascent is made by a series of cog-road inclines, up which the trains are drawn by cables and stationary engines. Granite spurs of the range are pierced by tunnels, and deep gorges are crossed on steel bridges. Every precaution is taken

to prevent washouts; for this is the most important railway line in the state, and heavy summer rains on the steep slope constantly threaten the security of the tracks. Hillsides are re-enforced with walls of masonry, channels are constructed to take care of the runoff, and the rocks beside the tracks are protected with a coating of tar to prevent them from being weakened by weathering.



W. H. Haas

FIG. 66. Cable railway leading up the steep east-facing escarpment of the Brazilian Plateau

The completion of the railroad was followed by the rapid development of the coffee region and the remarkable growth of the city of São Paulo, through which passes practically all the commerce of the upland. Although this railway was an expensive one to build, it is one of the most profitable roads in South America. Certainly it is a busy one. It operates many passenger trains and hauls about half the world's coffee.

3. *The Coffee Trade*

Santos as a Coffee Port. In Santos one seldom gets away from the pungent odor of green coffee or from the sight and sound of the coffee trade. The interests of the port center about this one commodity. Other commodities are exported,—cotton, frozen meats, and hides,—but they are insignificant in comparison with the São Paulo coffee crop. Exporters, commission houses, and all the banks of the city are located near the Coffee Exchange, and there are dozens of warehouses where the coffee is sorted, graded, and stored. In the offices, and even on the street, men are engaged in the business of buying and selling coffee. In the course of the year Santos harbor accommodates numerous ships engaged in foreign trade, and practically all of them load at least a few thousand bags of coffee. The wharves have accommodations

for fifty ocean ships, but it is not uncommon to see ten or a dozen ships anchored in the bay awaiting a chance to load.

Loading a Cargo. As befits the world's leading coffee port, Santos is equipped with up-to-date facilities for loading the coffee ships. Motor trucks and carts bring the coffee from the railway cars to the docks, and the bags are dropped upon automatic conveyors, which carry them into the ship's hold. Experienced men stow the bags in tiers, with strips of wood to hold the tiers in place. Coffee is a costly cargo, and skillful stowage has much to do with the condition in which it will reach its destination. Dampness is the principal danger which threatens a coffee cargo. The bags are protected from contact with metal fixtures of any kind, because of the tendency of metals to "sweat." The ships have ventilating machinery to keep air in circulation among the piles of coffee bags, and while the vessel is en route the hatches are opened in fine weather to let the hot air escape.

Coffee on the High Seas. The voyage from Santos to the consuming countries is a voyage across the full width of the tropical belt to middle-latitude ports. Most of the ships pursue a northeasterly course from Santos, and some of them stop at Rio de Janeiro for additional cargo. The route skirts the South American coast as far as Cape St. Roque (Plate IV) and there divides into two branches, one leading to Europe and the other to the United States. These two areas buy nearly the whole of the world's export of coffee, each taking approximately half.

Destinations of coffee ships. Coffee from Brazil enters Europe chiefly through four or five continental ports: Le Havre, Genoa, Hamburg, and the ports at the mouth of the Rhine. France and Germany take nearly half of the European imports. Great Britain is not a large consumer of coffee, tea being the more popular beverage in that country. Coffee enters the United States by way of three coasts, and one port on each coast stands out above its neighbors in importance. New York, New Orleans, and San Francisco receive more than 80 per cent of our coffee imports.

Difficulties en route to New York. For shipments to New York the last three days of the voyage form a critical period. Up to this time the cargo requires only the ordinary amount of care. Then conditions develop which call for special attention on the part of master and crew. From Santos to the latitude of Cape Hatteras the voyage is through the warm water of the tropical seas and the Gulf Stream.

Suddenly, upon leaving the Gulf Stream, the ship enters colder water. The temperature of the air also is likely to drop, and this causes the dreaded sweating to start. Then every effort must be made to keep the coffee dry. The ventilating machinery runs constantly. Unfortunately there is a stormy bit of sea off Cape Hatteras, and frequently the difficulties occasioned by the sudden drop in temperature are increased by rains which prevent opening the hatches. If the coffee becomes damp, it must be sorted in New York to remove the damaged beans, and this is an expensive process.

Coffee Trade of the United States. The people of the United States use more than 2000 tons of coffee daily. This large consumption makes the United States the most valued customer of the coffee-producing countries and calls for more than 40 per cent of the world's export coffee. Our imports come from forty-five countries, but more than 90 per cent originates in Eastern Brazil and Middle America. Small quantities are imported from East Africa and the East Indies (chiefly Java and Sumatra).

Our greatest coffee port. Approximately half the coffee used in the United States enters through the port of New York. There it is blended, roasted, and packed for distribution. New York has many advantages for dealing in coffee, a very important one being its location in the most densely peopled part of the country. The city itself is an important consuming area, and New York wholesale grocers ship to points as far west as Cleveland. New Orleans and San Francisco together import about two thirds as much as New York.

San Francisco and Western United States. San Francisco distributes to the western part of the country, shipments moving eastward at least as far as Denver and other cities of the Great Plains. San Francisco merchants long have imported coffee from Pacific ports of Guatemala and other Central American countries, and now they also receive coffee from Santos by way of the Panama Canal.

Importance of New Orleans. The coffee business of New Orleans is nearly half as great as that of New York. New Orleans has the advantage of being on a direct route of shipment to the interior sections of the United States from the coffee-growing districts of both Middle America and Brazil. Shipments to New Orleans, moreover, are not subject to abrupt changes in sea temperatures. In addition, New Orleans has excellent facilities for discharging and storing coffee and for rail and river shipments to interior points.

QUESTIONS

1. What countries compete with Brazil in producing the world's coffee? What region is the principal competitor?

2. Brazil has more than 8,000,000 acres (about 13,000 square miles) of coffee plantations. How does this area compare with the area of your state?

3. Why does the railway shown in Figure 66 have much traffic? Why have no competing lines been built? Why does it cost much to keep this line in repair?

4. Why do many Brazilian railways focus on São Paulo?

5. If you were traveling in Eastern Brazil, how could you tell when you were approaching the coffee country?

6. What native vegetation covered the São Paulo upland before the land was plowed? How does this fact affect the coffee industry of the present?

7. What kind of subsoil has the São Paulo coffee land? How is this kind of subsoil favorable for the coffee trees?

8. Does the São Paulo coffee harvest occur in the warmer season or the cooler season? in the drier season or the rainy season?

9. Many Santos coffee exporters live in São Paulo instead of in the port. Why?

10. Why does Santos ship more coffee than Rio de Janeiro?

11. Over which two ocean routes does Brazilian coffee move in large quantities?

12. Name the chief coffee-importing port of Germany; of France; of Italy. What other ports of Western Europe import considerable quantities of coffee?

13. Name the leading three coffee-importing ports of the United States and the territory which each port serves. Which port handles most coffee? Why?

EXERCISES

1. *Coffee climates in two hemispheres*

Figure 65 represents conditions in two coffee districts. Compare the districts by writing a paragraph to answer the following questions: (1) Which district is north of the equator, and which in the Southern Hemisphere? (2) Which station has the higher elevation above sea level (how much higher)? (3) Which month is warmest at Rio Claro, and which is warmest at Cordoba? (4) Which month is coolest at Rio Claro, and which is coolest at Cordoba? (5) Which half of the year has more rain at Rio Claro, April to September or October to March, and which half has more rain at Cordoba? (6) Since the Rio Claro coffee harvest occurs from May to August or September, when do the Cordoba growers probably harvest their crop?

2. *Cities in the coffee trade*

Locate and name on an outline map of the world the principal cities engaged in the Brazilian coffee trade. Show the cities connected with coffee production and export in red circles and the principal coffee-importing ports in blue circles. Show with black lines the ocean routes followed by the Brazilian coffee exports, as described on pages 129–130.

3. *Relation of harvest to seasons in the wet and dry tropics—a graphic presentation*

	J	F	M	A	M	J	J	A	S	O	N	D
Cuban sugar harvest												
Cuban rainy season												
São Paulo coffee harvest												
São Paulo rainy season												
Cordoba coffee harvest												
Cordoba rainy season												

Make a diagram to show the relation of harvest to rainy or dry season in three areas of Tropical America. Follow these directions:

a. Rule a sheet of paper as indicated above, making three double bars with spaces for the months.

b. On the bar for "Cuban sugar harvest" shade the spaces for the months when sugar-growers are cutting cane (p. 110) and leave other spaces blank.

c. On the bar for "Cuban rainy season" shade the spaces for months that have more than 5 inches of rain (Fig. 56).

d. Fill in the spaces of the bars for "São Paulo coffee harvest" and "São Paulo rainy season" in a similar way, taking facts from Figure 65 and page 126.

e. Shade the proper spaces to show the rainy season of the Cordoba District, Mexico (Fig. 65).

f. Shade appropriate spaces to show when you think the coffee harvest of the Cordoba District occurs. Like the harvest in São Paulo, the Cordoba coffee harvest lasts about four months.

3

THE UNITED STATES AND CANADA

CHAPTER X

INTRODUCING THE UNITED STATES

AMERICA'S PROSPERITY

They tell me thou art rich, my country: gold
In glittering floods has poured into thy chest;
Thy flocks and herds increase, thy barns are pressed
With harvest, and thy stores can hardly hold
Their merchandise; unending trains are rolled
Along thy network rails of East and West;
Thy factories and forges never rest;
Thou art enriched in all things bought and sold!

HENRY VAN DYKE

1. *A Map Portrait*

Distribution of Population

Distribution of Cities

Major Surface Divisions

Average Annual Precipitation

Major Drainage Divisions

Frost-Free Seasons in the United States

Agricultural Regions

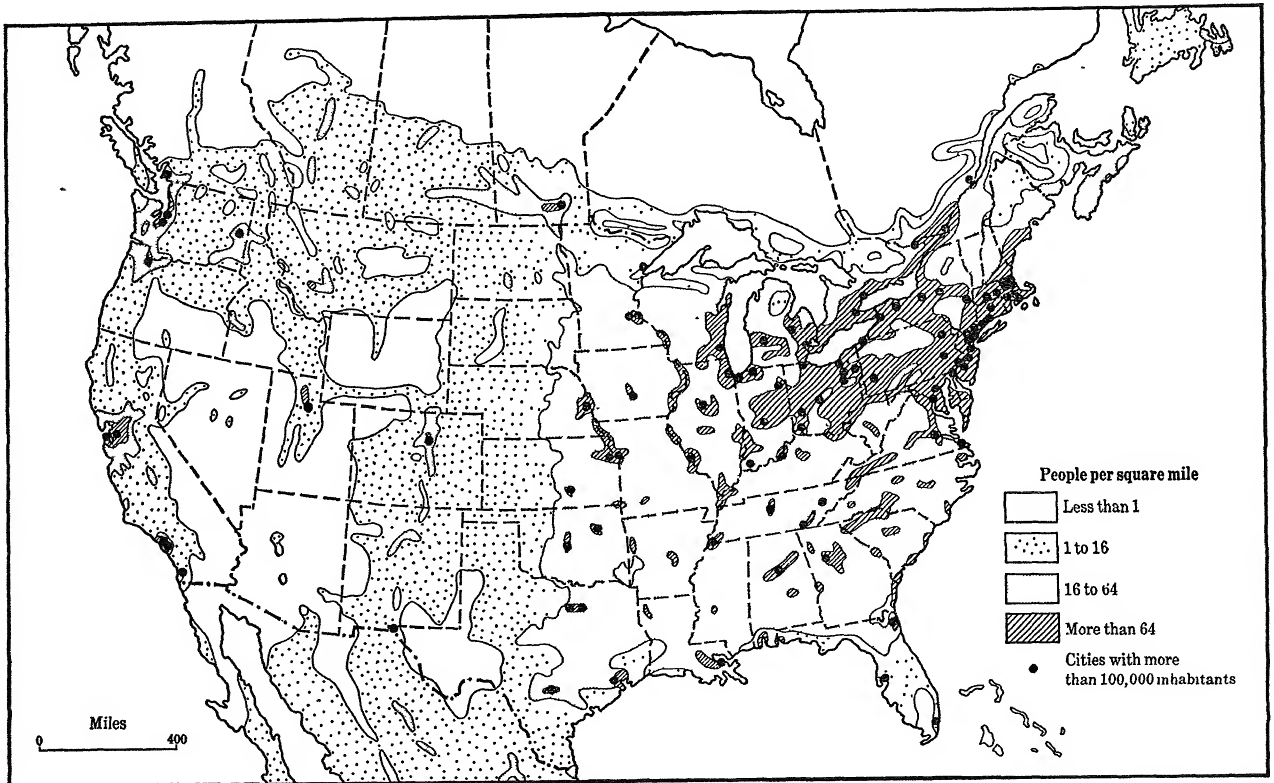
Land in Harvested Crops

Pasture in Farms

Forest and Arid Woodland

Principal Mineral-Producing Areas

Manufacturing Areas of the United States and Canada



Modified from Philips' Wall Atlas

Fig. 67. Distribution of population in the United States and Canada

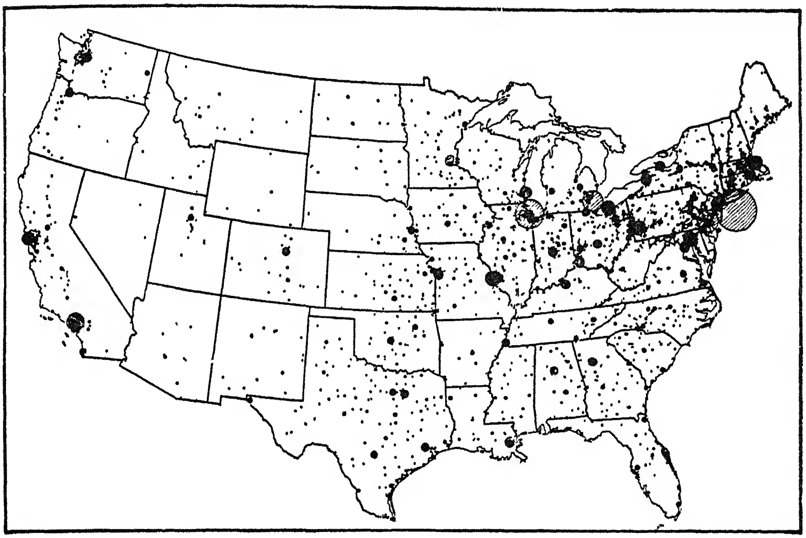


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FIG. 68. Distribution of cities in the United States

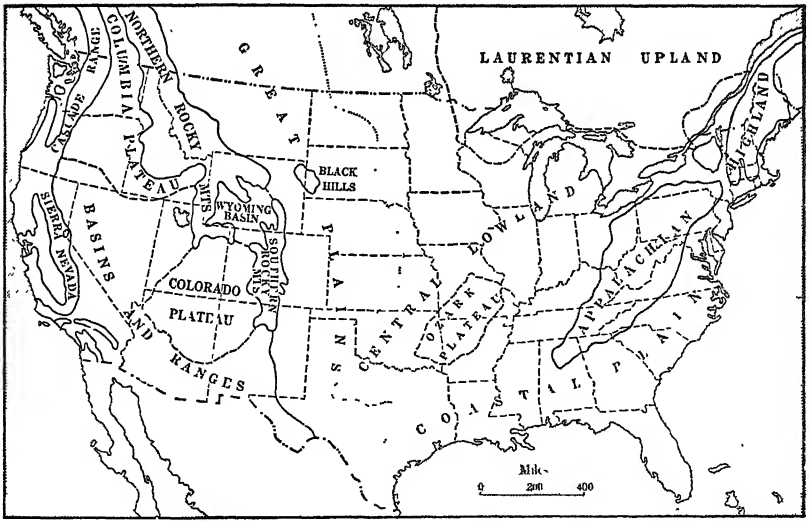


FIG. 69. Major surface divisions in the United States and southern Canada

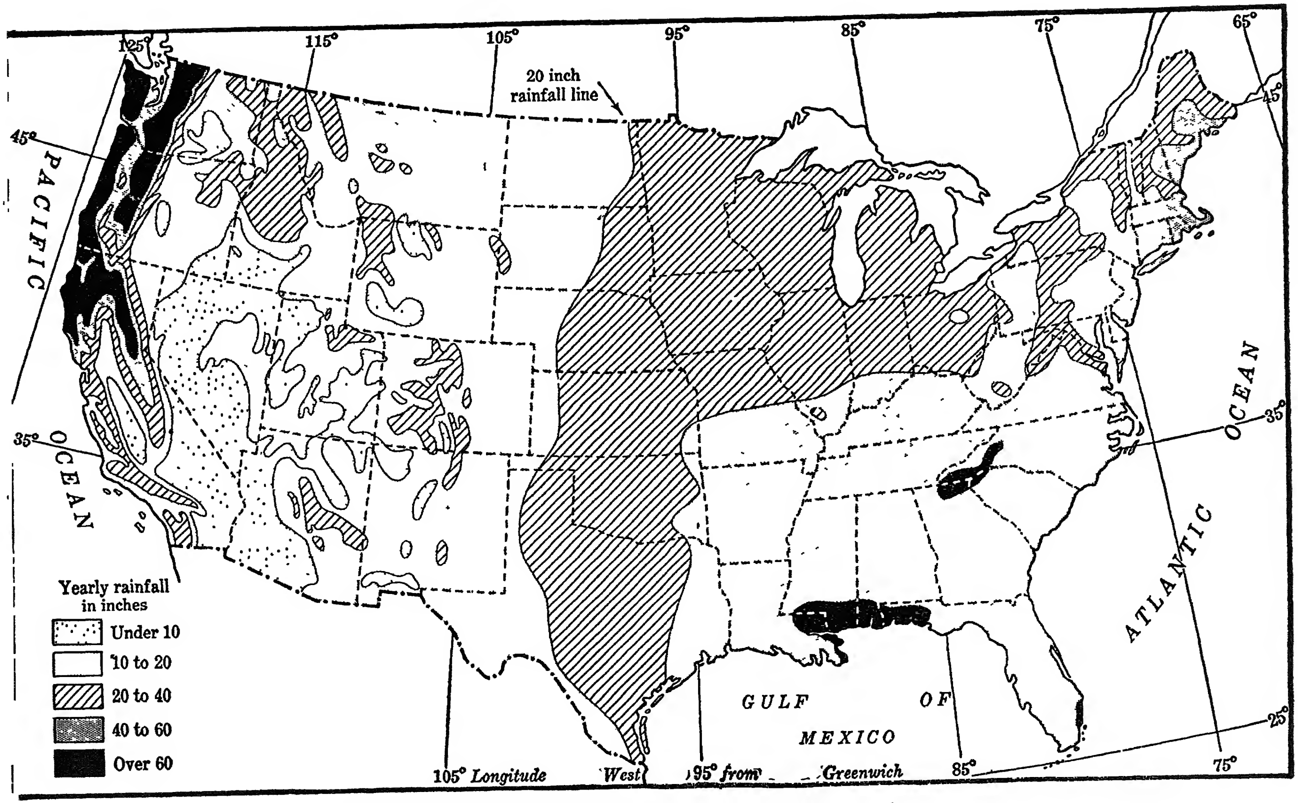


Fig. 70. Average annual precipitation in the United States

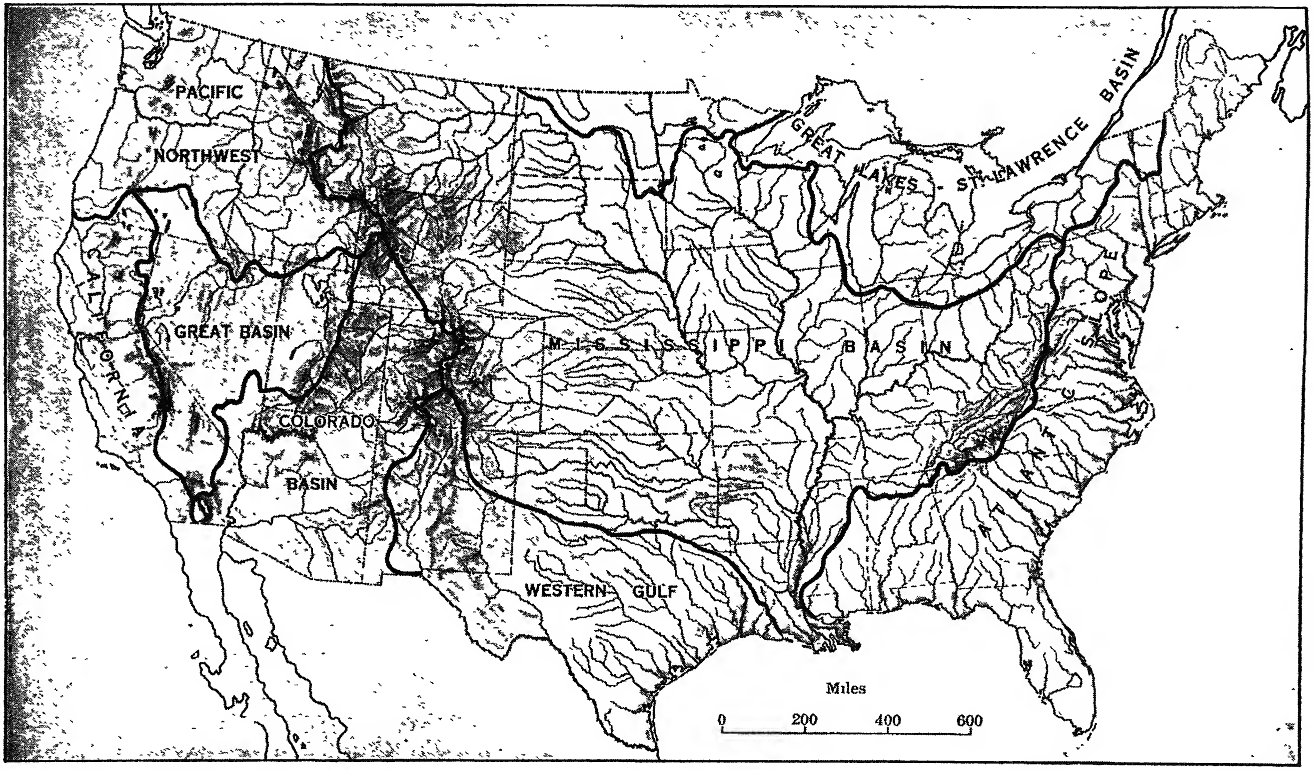


FIG. 71. Major drainage divisions of the United States

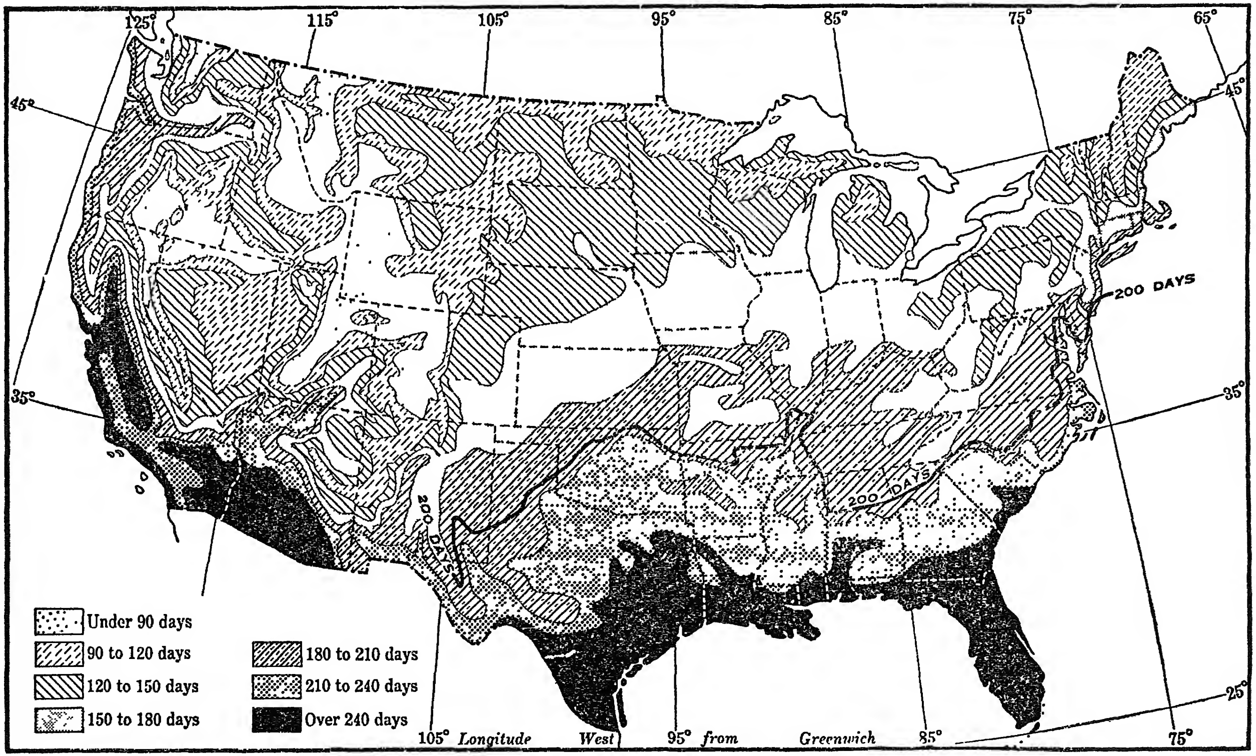
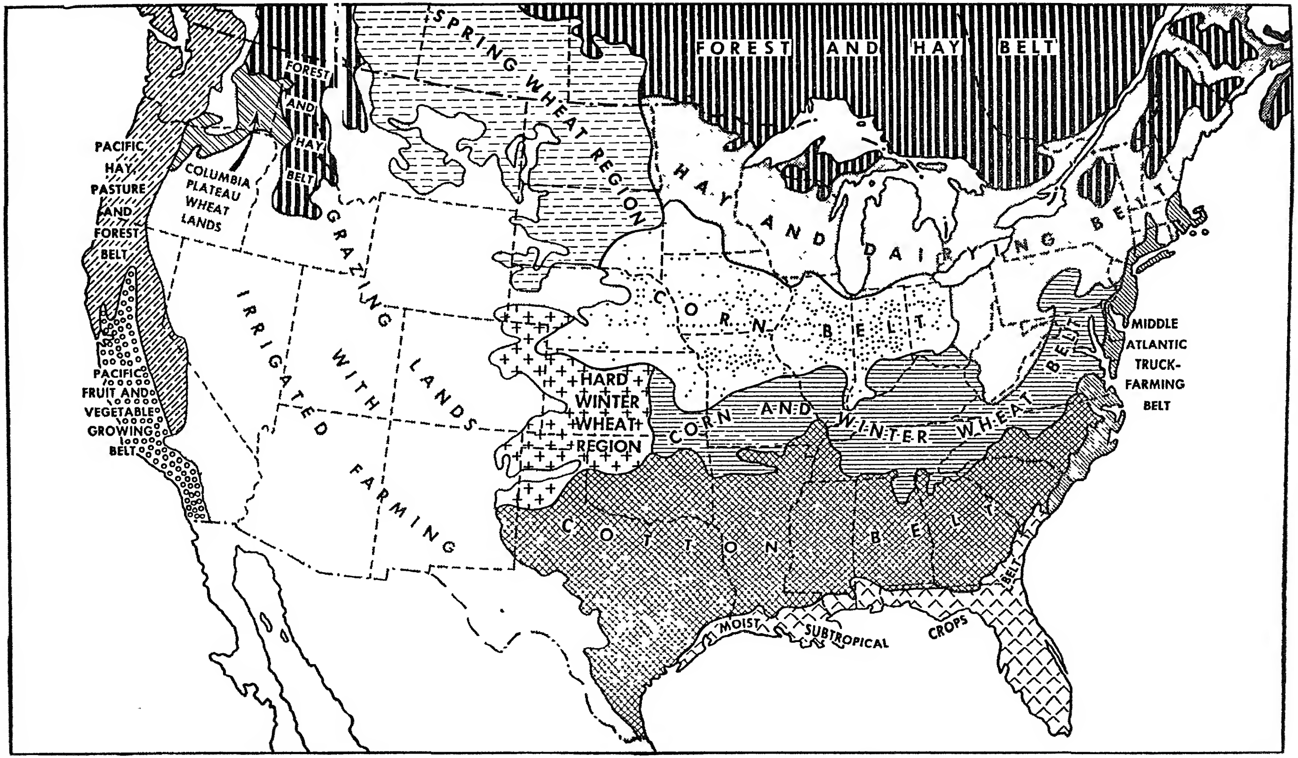
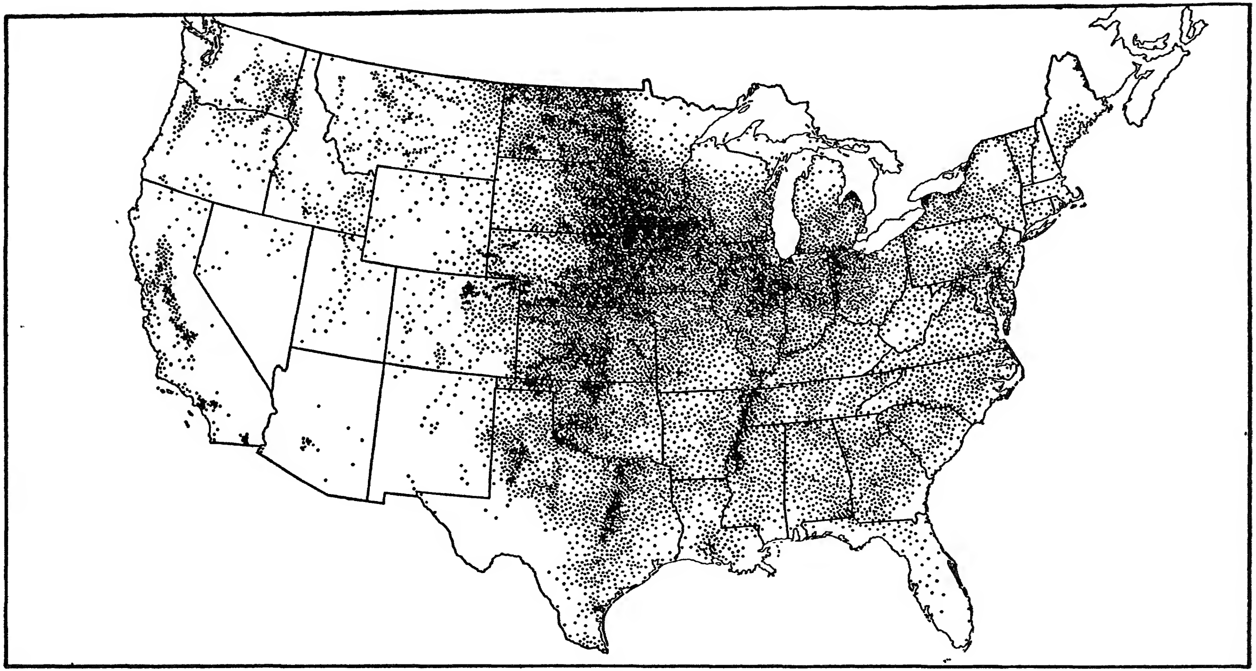


Fig. 72. Length of frost-free seasons in the United States



Adapted from map by O. E Baker of U. S Bureau of Agricultural Economics

Fig. 73. Agricultural regions of the United States and southern Canada



U. S. Department of Agriculture

Fig. 74. Land in harvested crops in the United States (each dot represents 2500 acres). Note the band of denser shading from North Dakota to Texas and the similar band from southern Minnesota to Ohio. The triangular-shaped area extending from Pittsburgh to southern Texas and northwestern North Dakota contains nearly two thirds of our cropland

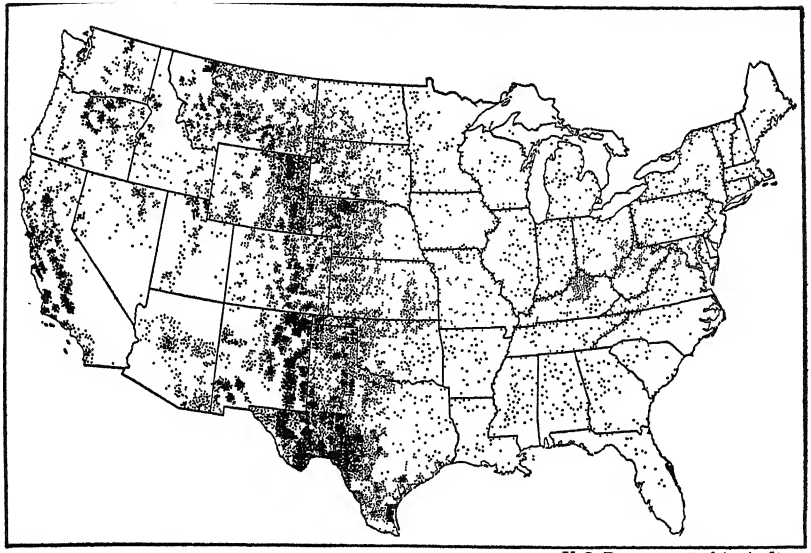


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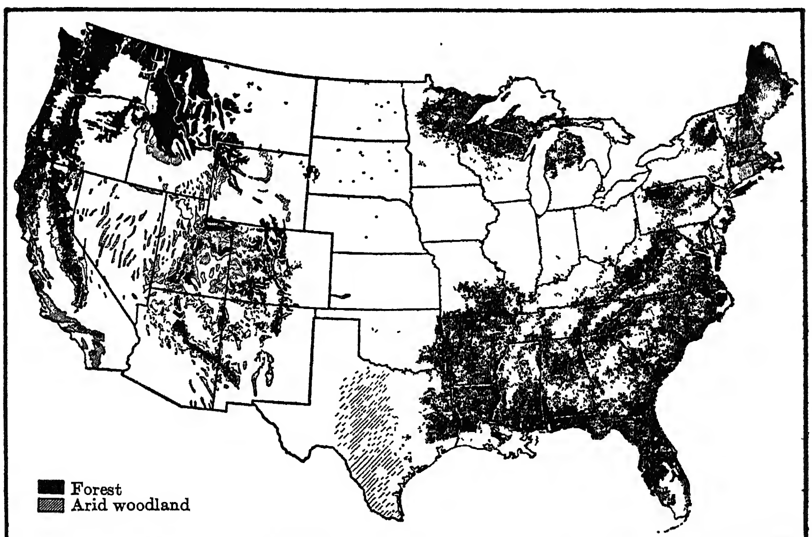
FIG. 75. Pasture in farms, excluding woodland pasture (each dot represents 2500 acres). The Great Plains region includes more than half the pasture land in farms in the United States. Much pasture in the Great Plains, however, is of low carrying capacity because of low rainfall



U. S. Department of Agriculture

FIG. 76. Forest and arid woodland in the United States (each dot represents 10,000 acres). Much of the forest area is made up of second-growth timber, some of which has little or no value at present. Compare this map with Figs. 69 and 70

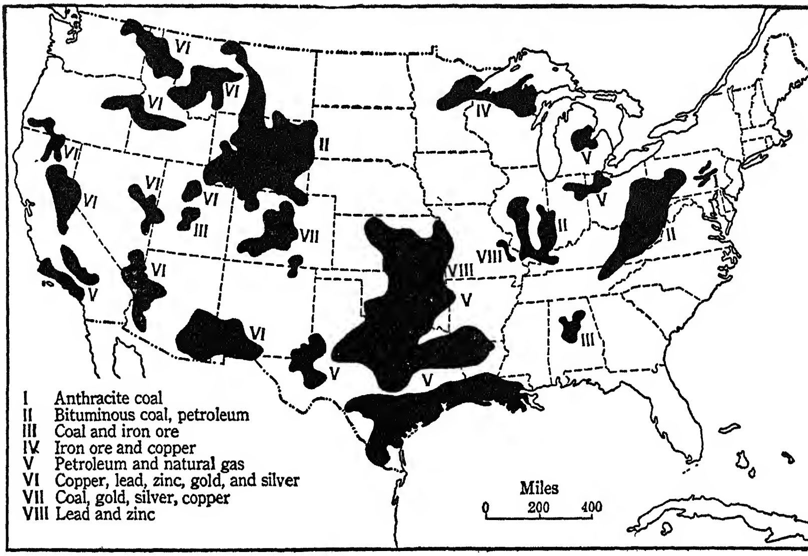


FIG. 77. Principal mineral-producing areas of the United States

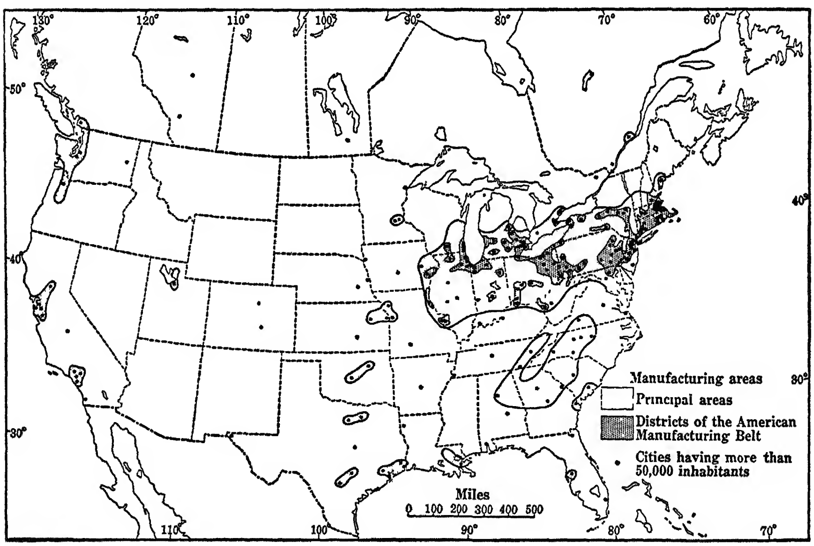


FIG. 78. Principal manufacturing areas of the United States and Canada. The largest area is known as the American Manufacturing Belt. The principal districts of that belt are shown by the darker shading. Cities of more than 50,000 population are shown with black dots

2. *Distinguishing Characteristics of the United States*

The United States as a National Property. As a national property the United States has high value. It is a large country, ranking in size with Canada, Brazil, the Soviet Union, China, India, and Australia. It contains more people than any other country except China, India, and the Soviet Union. Its people speak a common language, in sharp contrast to the diverse tongues of Europe, and they enjoy excellent educational and social advantages. It has a wide diversity of industries, and probably no other area of equal size in the world is as richly endowed with natural resources. Commercially it ranks among the leading nations of the world and has the great advantage of a frontage on both the Atlantic and the Pacific.

These distinguishing characteristics mean much to the industry and trade of our country, and students and businessmen alike will do well to keep them in mind. They will appear and reappear in our study of American industries and trade.

The United States as a market. The combination of large population, common speech, and general prosperity makes the United States a large and uniform market area. Manufacturers, mail-order houses, and, in fact, all lines of business interested in a widespread distribution of their output, find in the United States about 130 million people with similar tastes as to the general nature of their food, clothing, and housing. No other country of equal size and population can match the United States in this respect, and this large home market is of great importance to our industries.

The United States as a producer. In the production of goods the United States has high value as a national property. The products of our farms, ranches, mines, forests, fisheries, and factories are varied in character, fine in quality, and large in amount. Many of our industries not only produce enough to supply our domestic demand but also yield a surplus for export. This vast production is made possible by the highly favorable natural conditions prevailing in most of the country. Our forest, mineral, and water resources rank with or above those of any other country, and in many parts of our country the climate, soil, and surface are highly favorable for agriculture.

Distribution of population. The people of the United States are not distributed evenly over the country. Probably they never will be, for

some parts of the country are rich in resources and some are poor. Figure 67 shows that the eastern half of the country has more people than the western half; in fact, the eastern half has more than 85 per cent of the total population. In the western half people are concentrated in and about the big cities, with great stretches of sparsely settled or thinly settled country between (Figs. 67 and 68). Most of the eastern half of the country is moderately peopled (from 16 to 64 people per square mile). In the northeastern part of the country—that is, east of the Mississippi and north of the Ohio—there is a densely peopled section (more than 64 people per square mile). This is by far the most populous section of the country.

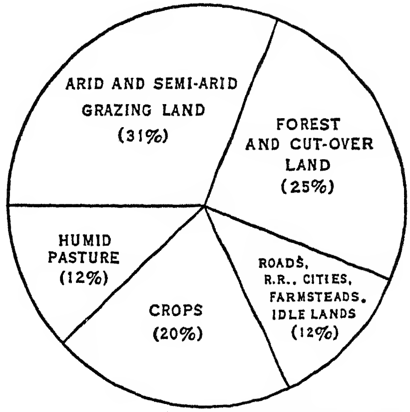
How American People Gain a Living. About 40 per cent of the people of this country are gainfully employed. The remainder are housewives, whose work is not recorded; dependents too young, too old, or too feeble to work regularly; or people unable to find work. Of the people gainfully employed, about a fourth are engaged in agriculture and a fourth in manufacturing. This emphasizes the importance of our land and our factories. Less than 3 per cent of our workers are employed in the three occupations of forestry, fishing, and mining, and most of these are in mining. It does not take many people to catch our fish, to care for our forests and cut our lumber, and to dig our minerals from the earth. Trade, transportation, and communication call for many people; in fact, together they employ about 20 per cent of our gainfully employed. This leaves something more than a fourth to be employed in professional, domestic, clerical, and public services.

Uses of Land. Grazing land and pasture together make up more than 40 per cent of the area of our country; forests and woodland, 25 per cent; and cropland about 20 per cent (Fig. 79). The remainder is occupied by cities, villages, farmsteads, roads, railroads, parks, and the like. As might be expected, the uses overlap. Some forests are pastured. Some land is used for crops in certain years and for pasture in others, or for both crops and pasture in the same year.

Outside our cities most land is devoted to crops if it is good enough. Our crops are selected and handled so as to produce large returns per acre. To this end the land is carefully prepared and perhaps fertilized, and the plants are cultivated and protected throughout their growth. All this means that on poor land the time and effort are likely to be wasted. The tendency, therefore, is to put crops on the better

land and to devote the poorer land to forests and pasture. If the pasture is considered a major crop, as in some dairying areas, the best land may be devoted to it.

Agriculture and Our Humid Fertile Plains. Agriculture is widely distributed in the United States, and nearly 40 per cent of our population lives on farms or in farm villages. The products of our farms represent a large part of our national wealth. The United States, like the Soviet Union, China, and India, is an agricultural nation of great size. The agricultural production of any one of these countries, however, is less than three fourths that of the United States. The high rank of the United States and of these other countries in agriculture grows out of their possession of huge areas of humid fertile plains. Such plains are, in the long run, the greatest asset which mankind knows.



U. S. Department of Agriculture

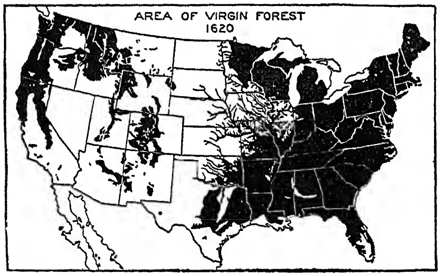
FIG. 79. Uses of land in the United States

Cropland. In spite of the wide distribution of agriculture, only half the land of the United States is in farms and only part of the farm land produces crops. High elevations, steep slopes, poor soils, poor drainage, and lack of rain make large areas unfit for cultivation. In fact, for every acre of cropland, our country has four acres that produce no crops (Figs. 74 and 79). The greater part of our cropland is in the humid and more nearly level eastern half of the country.

Major crops. Many crops are grown in the United States, but five of them—corn, hay and forage, cotton, wheat, and oats—are our agricultural giants. They occupy nearly 90 per cent of our cropland, account for about 75 per cent of the total value of our crops, and claim the interest of a large proportion of our farmers. Our fruit and vegetable crops have a relatively high value in comparison with the area they occupy. For the most part they are grown on high-priced land and by farmers who specialize in fruit or vegetable culture.

Pasture and livestock. Pasture land is of two types: the humid pastures of the East and the arid and semiarid grazing land of the West

(Figs. 73 and 75). The former may be plowed for crops from time to time, the grass in many cases being planted like any other crop. In the latter the pasture consists of wild or native grass and other plants. Both types of pasture are used for grazing livestock. Our livestock represents a highly important part of our national wealth. The interest in livestock grows out of the great demand for meat and other animal products both in our own country and in Europe. In order to feed our livestock, large areas are kept in pasture and large acreages of corn, alfalfa, clover, and other crops are grown. Of the cropland in this country approximately 70 per cent is devoted to producing feed for stock, 21 per cent to human food, and 9 per cent to fiber and other crops. Hogs, cattle, and sheep are our principal classes of livestock. The Middle West produces most of the hogs, many of the beef cattle, and some of the sheep shipped to our markets. In Western United States but few hogs are raised, and the beef cattle and sheep come mainly from large ranches. In the northeastern part of the country the principal livestock industry is dairy farming.

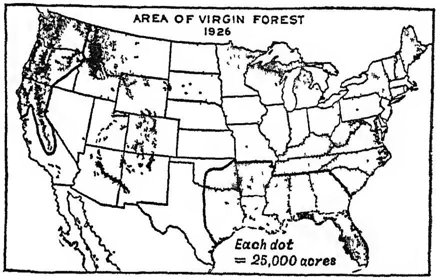


U S Forest Service

Fig. 80. Extent of virgin forest in 1620

Agricultural regions. Agriculture differs so much from section to section of the United States that a dozen agricultural regions may be recognized (Fig. 73). In traveling through one of these regions during the growing season, one notices that a certain crop or a combination of crops stands out prominently. Corn, cotton, and wheat, for example, are so conspicuous in the principal areas where they are grown that they give name, respectively, to the Corn Belt, the Cotton Belt, and the Wheat Regions. The Hay and Dairying Belt is so named because the farmers ship large quantities of butter, cheese, milk, and cream, devoting much land to hay in order to feed the dairy cattle. In the Grazing Lands with Irrigated Farming, grazing on the semiarid and desert grasslands is associated with the cultivation of areas that have water for irrigation. The Pacific Fruit and Vegetable Growing Belt specializes in fruit and vegetable production, but also produces a variety of other crops.

Forest Industries and Forest Resources. The United States uses about two fifths of the forest products consumed in the entire world. Among the more important commercial products are lumber, pulpwood for the manufacture of paper and rayon, railroad ties, and veneer for the manufacture of furniture. In addition, much wood cut from near-by forests or from wood lots is used for fuel on farms and in village homes. Our large use of forest products is in harmony with our large stands of fine timber and also with the relatively short time we have been cutting from our forests. While the older manufacturing nations in Western Europe now draw much of their lumber from distant areas, the United States still produces enough lumber for its own needs and for a large export trade as well.

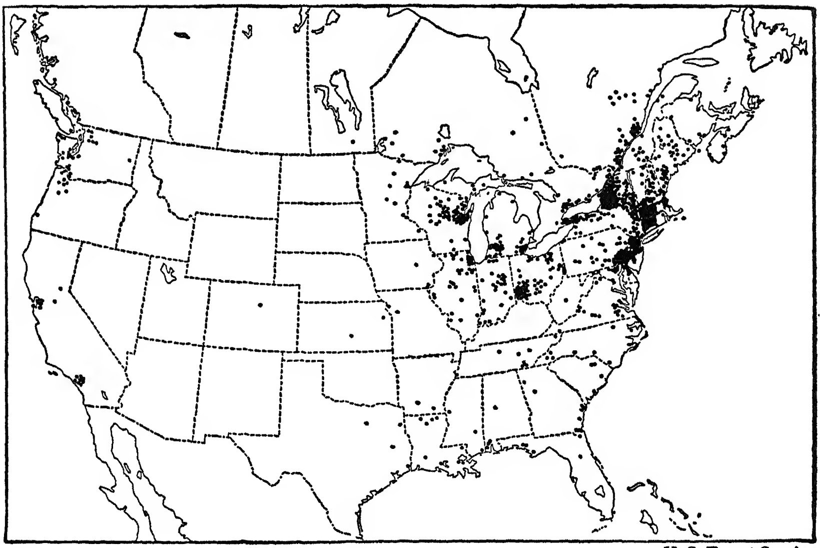


U. S. Forest Service

FIG. 81. Extent of virgin forest in 1926. Each of the areas enclosed by heavy black lines produces about 35 per cent of our lumber

Lumber and paper. Up to the present, cheap lumber has been one of our national assets. Early settlers found most of the eastern half of the country covered with forest (Fig. 80), but in time much of the forest land was cleared for farming (Fig. 81). For many decades our forests proved a barrier to settlement, and we wished to get rid of them. As cities grew and settlements were made on the treeless prairies and plains, a demand for large quantities of lumber arose. For many years the white-pine forests of northern New England, northern New York, and the northern parts of Michigan, Wisconsin, and Minnesota supplied the demand. In time most of the timber in these areas was cut. The lumber industry then moved on to the southern and western forests, leaving behind vast stretches of cut-over lands yielding neither lumber nor crops. Today the second-growth timber of the cutover areas is being utilized for the manufacture of wood pulp. These areas and neighboring parts of eastern Canada supply us with newsprint and other coarse paper (Fig. 82).

Our future lumber supply. As time goes on the United States must face the grave question of its lumber supply. The end of our virgin forest is in sight, and when it is gone we shall have to grow timber as



U. S. Forest Service

FIG. 82. Paper and pulp mills in the United States and Canada. Compare this map with Figures 76, 78, and 81

a crop. Timber grown by man, however, is bound to cost more than timber grown by nature. Thus the end of our virgin forest means the end of our cheap lumber. In order to postpone that day, our Federal government has set aside certain non-agricultural areas as national forests, and in those areas only the mature lumber is cut. Under this plan lumbering may go on indefinitely. Some of our large lumber companies recently have adopted a similar policy on some of their lands. We no longer wish to get rid of our forests but, instead, now wish to use them intelligently. Thus do we modify our ideas and our policies with our changing environment.

Mining Industries and Mineral Resources. The United States is distinguished among nations by its large and varied mineral resources and by the importance of its mineral industries. In comparing the mineral production of the United States with that of another country, the huge extent of our country should be kept in mind. Even on the basis of equal area, however, the United States is richly endowed with minerals. Not all parts of the world have been fully explored for their mineral resources; but according to present surveys, no other area of equal size appears to be as richly supplied with useful minerals as is the United States.

Why we import certain minerals. In its *Minerals Yearbook* the United States Bureau of Mines reports on more than fifty minerals. Most of the fifty are produced on a commercial basis in this country; but for such important minerals as tin, nickel, and potash we are largely dependent on other countries. We import, moreover, considerable quantities of minerals for use in Eastern United States, even though there is a large production of the same mineral in our own country. This practice grows out of the fact that in some cases minerals may be brought to our coastal cities more cheaply by sea from a foreign country than by land from another part of the United States. In addition, some ores from foreign countries are brought to this country to be refined for export.

A wealth of basic minerals. Of coal, iron ore, copper, and petroleum, the basic minerals in modern industry and transportation, the United States produces more than any other country. These minerals are of such vital importance in our welfare that among our national assets they may be classed with our farm lands and our forests. We are abundantly supplied also with such metals as lead, zinc, gold, and silver and with such construction materials as limestone, slate, sandstone, and clay.

Principal mineral areas. Like our other natural resources, our minerals are distributed irregularly over the country (Fig. 77). On the whole, our more important mineral resources lie inland rather than along our coasts. Such a distribution is more favorable for use within the country than it is for sales abroad. The eastern half of the country is especially rich in coal and iron and has produced large quantities of petroleum. The western half produces most of our copper, lead, zinc, gold, and silver, has large deposits of coal, and is rich in petroleum and other minerals.

Fisheries and Fishing Grounds. The fisheries of the United States are varied in character. Fresh, canned, dried, and salt fish are sold in practically all parts of the country. Some fish are caught in the Great Lakes and our other inland waters, but our sea fisheries yield by far the larger part of our catch. In a broad way the sea fishing grounds of North America may be divided into four areas (Plate I). The first is along the eastern coast from Cape Hatteras to Newfoundland. It supports the important oyster fisheries of Chesapeake Bay and Long Island Sound, and the productive cod fisheries of the "banks" from Boston to Newfoundland. The second of our fishing grounds extends

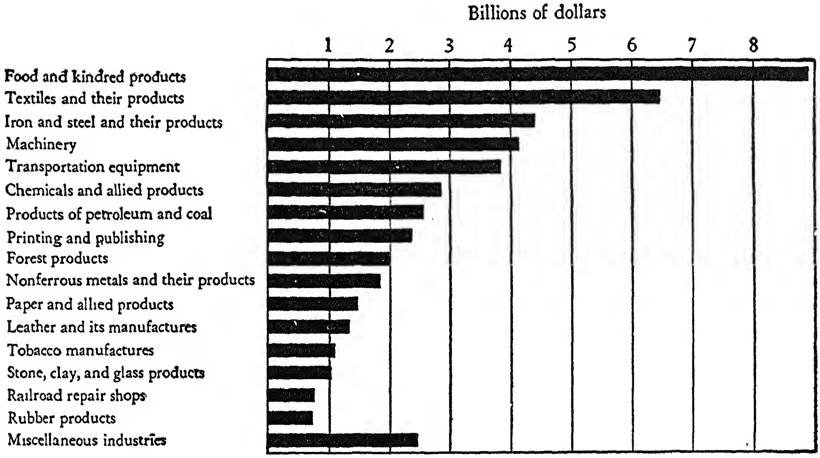


FIG. 83. Relative rank of the manufacturing groups of the United States in billions of dollars

southward from Cape Hatteras and includes the sponge and food fisheries of our South Atlantic and Gulf states. The third area lies along our Pacific Coast south of San Francisco and yields large quantities of tuna fish and sardines. The fourth area extends from San Francisco north to Alaska and is famous for its salmon fisheries. Canned salmon from this area is sold widely in both domestic and foreign markets.

Our sea fish are caught in the shallow waters of the continental shelf (Plate I). The term "continental shelf" is applied to that part of the continent which is covered by the shallow ocean waters bordering the continent. The continental shelf, therefore, marks a belt of transition from deep sea to land. Some parts of the continental shelf, such as Newfoundland and Vancouver Island, appear above the water as islands. Other parts are high enough to make the water over them very shallow. These shallow offshore areas, or "banks," as they are called, together with the bays and sounds along the coast, furnish the feeding and spawning grounds of great schools of fish. From these grounds comes the major part of the catch of our fishing industry.

Manufacturing Industries and Areas. More than 330 manufacturing industries are recognized by our census, but these may be classified into the 17 groups shown in Figure 83. The food group includes such important lines as meat-packing, flour-milling, and the bakery industries. Automobile tires rank as the leading item in the rubber group, and automobiles take first place under transportation equipment. The

textile group includes not only spinning and weaving but the manufacture of clothing as well. The iron and steel group is made up of an array of industries from the smelting of iron ore in blast furnaces to the manufacture of tools, cutlery, and hardware. As might be expected in a country where machines are employed in almost every phase of life, the manufacture of agricultural, electrical, mining, and other machinery looms large among our manufacturing industries. The chemical industries, including the manufacture of explosives, dyestuffs, fertilizers, rayon, and medicines, are relatively new in this country. They may be expected to expand greatly in the future through discoveries made by the science of chemistry.

The Manufacturing Belt. Most of our factories are located in the northeastern quarter of the country, in a broad belt extending from the Atlantic Coast to the Mississippi River (Fig. 78). The belt is known as the American Manufacturing Belt and includes the districts from Boston to Baltimore on the east, the districts about Pittsburgh, Cleveland, and Detroit in the center, and the Chicago and St. Louis districts on the west.

Other manufacturing areas. The United States is a young country, and from time to time changes occur in our manufacturing map. Offshoots of the main belt are found at Montreal in Canada, at the "Twin Cities" in Minnesota, and in the Kansas City section of the Missouri Valley. In the southeastern part of the United States there is an important manufacturing area in process of development. This area extends in an irregular horseshoe curve about the southern Appalachian Mountains from eastern Tennessee through Alabama, Georgia, and North and South Carolina to Virginia. An area of considerable possibilities for the future lies in eastern Texas and includes such cities as Dallas, San Antonio, and Houston. On the Pacific Coast some manufacturing is carried on in and about the principal cities.

Raw materials and their sources. Raw materials in great variety and abundance constitute one of our major national assets. Our manufacturing industries draw raw materials from all parts of this country and from many foreign countries. In general, manufacturing establishments in the interior get their raw materials from domestic sources; for their inland position handicaps them in getting oversea supplies, and the interior is rich in raw materials. The meat-packing, flour-milling, and iron and steel industries are examples of interior industries depending on domestic raw materials. In many instances

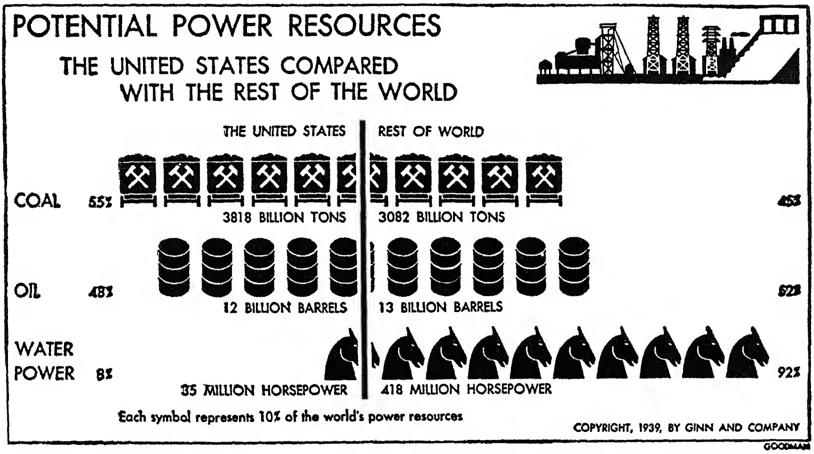


FIG. 84. Potential power resources of the United States compared with those of the rest of the world

industries on the seaboard also depend upon domestic raw materials, but more and more they are looking overseas for part or all of their supplies. The seaboard sugar-refining and tanning industries, for example, depend largely on imported materials. We can see, even in this broad way, how the location of our manufacturing industries is related to domestic and foreign raw materials.

Power and its distribution. The United States is generously supplied with coal, petroleum, and water power, the principal sources of mechanical energy. Our share of each of the world's power resources is shown in Figure 84. Coal is by far the most important source of power for manufacturing, and as long as this is the case the United States bids fair to occupy a prominent place among manufacturing nations. The center of our coal production is not far from the center of Ohio; but the center of our coal resources lies west of the Mississippi. The fact that our coal resources are in the interior of the continent is bound to have a bearing on the further development of manufacturing. This condition is offset in part by the fact that most of our water power is relatively near our coasts (Fig. 85).

Our Water Resources. As a nation the United States has large water resources, uses great quantities of water, and faces difficult water problems. Changing seasons bring their problems. Spring rains and melting snows may cause floods, whereas in late summer streams may dwindle and wells fail. The need for water in cities,

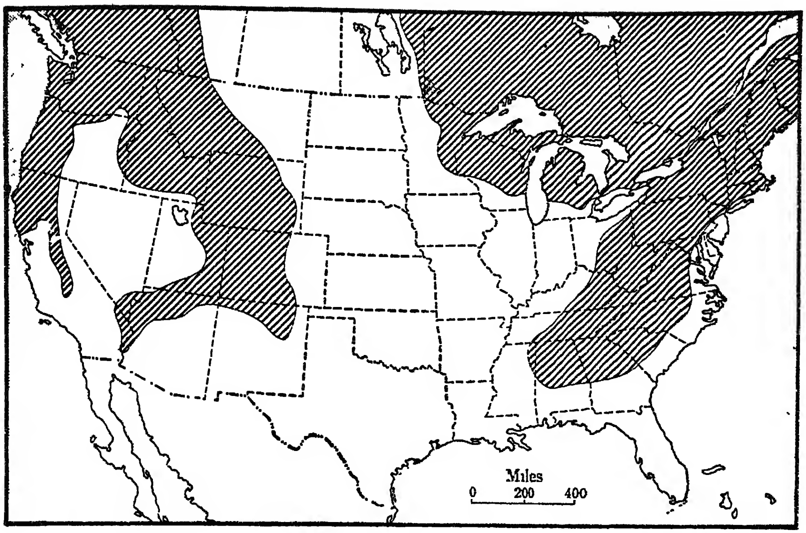


Fig. 85. Major water-power areas of the United States and Canada

in factories, and on farms continues, and the problem of saving the spring surplus for summer use is for the most part unsolved. The problem of flood followed by drought is so big and so difficult that it demands the thought and co-operation of the nation as a whole.

Water resources, water needs, and water problems differ from one part of the country to another (Figs. 86 and 71). The rainfall map (Fig. 70) suggests the general distribution of our water resources. The eastern half of the country is richer in water, for an abundant rainfall means plenty of water in streams and wells. Much of the West is arid or semiarid, and there a supply of water is the big question. Even our state laws reflect the contrast between the humid and drier halves of our country; for the laws dealing with the use of rivers and other water resources in the Eastern states are quite different from those of the West.

Domestic Trade. The great variety of goods demanded by modern life, together with the irregular distribution of our industries, leads to a huge exchange of goods within our country. Although its volume is not known, this domestic trade is the core of American business life, and we need to understand at least its larger currents. We can make progress toward this goal by studying the trade growing out of the production and use of such important commodities as

Drainage Areas, Stream Pattern, and Flow	Uses, Needs, and Problems
ATLANTIC SLOPE	ATLANTIC SLOPE
Many small rivers, each flowing independently to sea. Flow fairly regular in this region of abundant rain evenly distributed throughout year. Much water obtained from ground-water supplies.	Major function of streams is to furnish water to cities and to carry away sewage. Paper, chemical, steel, and other manufacturing plants use huge quantities of water. A big problem is to prevent pollution of water supplies in metropolitan areas Coastal waterways of much use for navigation Streams harnessed for hydroelectric power, especially in Southern states
GREAT LAKES—ST. LAWRENCE	GREAT LAKES—ST. LAWRENCE
Great Lakes, with water surface of 95,000 square miles, constitute great natural reservoirs and pour steady stream of water into St. Lawrence. From Duluth to Montreal is 1540 miles; from Chicago to Montreal, 1250 miles. Although Great Lakes are far inland they are not high above sea; surface of Lake Superior lying at 602 feet. Half of drop to sea level in Niagara River.	Great inland waterway. By means of canals small vessels can reach Montreal at head of ocean navigation. Much hydroelectric power developed at Niagara Falls and along swift-flowing tributaries of St Lawrence. Lakes provide pure clean water for numerous port cities. Shores of large and small lakes much used for recreation. Some cities empty sewage into lakes, and this may cause pollution of water supply. Propose canals for ocean-going vessels around rapids in St Lawrence above Montreal.
THE MISSISSIPPI BASIN	THE MISSISSIPPI BASIN
Lower Mississippi carries to sea drainage from about 1,239,000 square miles. Missouri, Upper Mississippi, and Ohio are principal tributaries Missouri drains 43 per cent of the whole basin; but as much of its drainage basin is semiarid, its flow is irregular. Ohio shorter than either Missouri or Upper Mississippi; yet, as it drains humid area, it brings in as much water as other two combined.	Missouri River carries water from Rocky Mountains for irrigation in semi-arid Great Plains It is subject to floods during spring thaws in Middle West and again in June, when snows are melting in high mountains. Farms and many towns back from river use ground water from wells. Upper Mississippi furnishes city water supply, sewage disposal, recreation, and is used in small way for power and navigation Area contains thousands of lakes, many of which are developed as summer resorts. Ohio is a source of water supply for cities and manufacturing plants, a great sewer, and a highway. Melting snow and heavy spring rains lead to great floods in some years. Control of these floods and those of Lower Mississippi is great national problem. Lower Mississippi much used for navigation.

Western Gulf Area includes Rio Grande Basin and several small basins. Rio Grande draws water from two mountain areas: Southern Rockies and mountains of Mexico. Rivers flowing across Texas are fed by rains on Great Plains and vary greatly in volume from season to season.	**Western Gulf** Irrigation and farm and city water supply are all-important questions in the desert and semiarid sections of this area.
Colorado Basin and Great Basin Colorado River rises on west flank of Southern Rockies, and its major tributary, the Green River, rises in mountains of Wyoming. Lower part of Colorado Basin lies in Mexico. Great Basin has interior drainage, in that none of its streams reaches the sea.	**Colorado Basin and Great Basin** Scarcity of water limits use of land in these arid basins. Largest irrigated area in Great Basin lies about Salt Lake City and draws water from high Wasatch Mountains. Spectacular Boulder Dam across Colorado River creates great reservoir of water, helps regulate flow of lower river, provides water for power and irrigation and for municipal use in Los Angeles and other cities. Water of Colorado is furnished by high mountains and plateaus; but most of it is used in lowlands of lower basin, where there is almost a year-round growing season
Pacific Northwest Puget Sound with its numerous arms, Columbia River, and several small streams make up water bodies of this area. Columbia River rises in rainy mountains and flows through desert and semiarid country east of Cascade Mountains.	**Pacific Northwest** Puget Sound, with its numerous arms, is a much-used waterway. Tributary mountain streams draining areas with heaviest precipitation in United States are possible sources of water power. Grand Coulee and Bonneville dams are uppermost and lowermost of system of ten dams proposed for Columbia River. They are to furnish hydroelectric power and provide water for irrigation.
California San Francisco Bay and its major tributaries—Sacramento and San Joaquin rivers—are major water bodies of California. California is arid in south, semiarid in interior valleys, and humid in mountains and in northwest.	**California** California, with its population of more than six million, is dependent upon water for its future growth Water needed most urgently for irrigation and for domestic and industrial use in cities.

Fig. 86. Water resources and the major water uses, needs, and problems in the major drainage areas of the United States

Territories and Possessions	Principal Products	Gross Area in Square Miles	Population in 1940	Date of Accession
Alaska	Canned salmon, gold, copper, furs	586,400	72,524	1867
Hawaii	Raw sugar, pineapples, canned pineapple, and pineapple juice	6,407	423,330	1898
Philippine Islands	Rough rice, Manila hemp, copra, sugar, tobacco processed, chromite ore	144,400	16,356,000	1899
Puerto Rico	Sugar, tobacco, coffee, pineapples	3,435	1,869,255	1898
Guam	Coconut oil, copra	206	22,290	1898
American Samoa	Copra	76	12,908	1900
Panama Canal Zone		549	51,827	1904
Virgin Islands	Essential oils, distilled liquors	133	24,889	1917

FIG. 87. Size, population, date of accession, and principal products of the territories and possessions of the United States

wheat, cotton, petroleum, and iron and steel. In many cases the products of an industry move from one section of the country to another or from one part to all parts of the country. Our internal trade, therefore, ties the whole country together in many ways.

Outlying Territories and Possessions. Beyond its own borders the United States has the territories and possessions shown in Figure 87. Alaska, the first acquired, has about four fifths of the total area of these lands, but the Philippine Islands have four fifths of the population. Although Alaska's population numbers less than that of Mobile, Alabama, the value of its products has made it a very good investment in view of the $7,000,000 we paid Russia for it. Hawaii Territory, Puerto Rico, and the Philippines, as we learned in Chapter VIII, are sources of cane sugar and other tropical products. The Panama Canal Zone, Guam, Samoa, and the Virgin Islands are of importance to us in their relation to the ocean trade routes followed by our commerce.

QUESTIONS

1. How many people per square mile are there in most of the eastern half of the United States (Fig. 67)?

2. How many people per square mile are there in most of the area between New York and Chicago?

3. Which has more people per square mile, the northeastern quarter of the United States or the southeastern quarter?

4. What density of population prevails in the vicinity of (1) Seattle, (2) Portland, (3) San Francisco, (4) Los Angeles, (5) Spokane, (6) Salt Lake City, and (7) Denver? In general, which density prevails between the cities of the Pacific Coast? What density prevails between Salt Lake City and San Francisco?

5. Which quarter of the United States contains most large cities (Fig. 68)?

6. What are the largest three surface divisions of the United States (Fig. 69)?

7. What highlands are included in the major water-power areas (compare Figs. 69 and 85)?

8. How does the average annual precipitation in each of these highland areas compare with the precipitation of the neighboring lowlands (Fig. 70)?

9. Name the principal streams which drain these highlands (Plate III). What would be true of the velocity of the streams within the highland areas?

10. Why should there be water-power possibilities in the highland areas?

11. In what type of surface feature does the Tennessee River rise? How does the precipitation of that area compare with the rest of Eastern United States? What effect does this amount of precipitation have on the flow of the Tennessee River?

12. What surface features and what climatic conditions interfere with navigation on the St. Lawrence River (see pages 405–408)?

13. Why is the Ohio River better suited to navigation than the Missouri?

14. Why is Mexico entitled to a share of irrigation water from the Rio Grande and the Colorado River?

15. In which sections of the United States is the use of water in manufacturing highly important (Figs. 78, 85, and 86)?

EXERCISES

1. *A comparison of Eastern and Western United States*

Answer the following questions by completing the accompanying table.

a. Which has the denser population?

b. Which has more cropland?

c. Which has a larger area devoted to grazing and irrigated crops?
d. Which receives more rain?
e. Which contains more factories?
f. Which has more cities?
g. Which has more mountainous land?
h. Which has the greater area in plateaus?

	Eastern United States	Western United States
a. Which has the denser population?	√	

2. *Land use in the United States*

Answer the following questions in writing.

a. Where is the major body of land from which crops are harvested in the United States? Explain in terms of surface features, precipitation, and frost-free season.

b. Characterize the major manufacturing belt as to (1) land in harvested crops, (2) agricultural regions, (3) forest and woodland, (4) minerals produced, (5) uses of water, and (6) number of cities of 50,000 or more population as compared with the rest of the country.

c. For what purposes do people use land in the Great Basin (Figs. 71, 73, 74, 75, and 76)?

d. Which agricultural regions lie in the part of the country that has 20 inches or more of precipitation (Figs. 70 and 73)?

3. *Characteristics of the area in which you live*

Prepare a list of the conditions that are true of the section of the country in which you live. Base your list on the maps in Chapter X.

CHAPTER XI

TRANSPORTATION IN THE UNITED STATES

1. *Our Transportation Facilities*

The United States has more miles of railway, more miles of highway, and more miles of marked and lighted airways than any other country. It has natural waterways, some of which rank among the great waterways of the world. Its wealth of exports and imports attracts the ships of all seafaring nations. Furthermore, ships under the American flag cruise the great ocean highways, ply along the Atlantic and Pacific coasts, and carry on a large intercoastal traffic. The importance of the United States in land, air, and sea transportation is the outcome of the following conditions:

1. The United States is a big country, and its very size would call for both long and short lines of transport.
2. Every section of the country has some form of natural wealth and every section produces goods wanted in all the other sections. Country-wide systems of transport are needed to connect these areas.
3. The richest farm and mineral lands of the United States lie in the interior of the continent, and our major transport problem is to connect these fertile midlands with the sea.
4. Facing both the Atlantic and the Pacific Ocean, the United States is exceptionally well placed to share in overseas trade.

Evolution of American Transport. In building, equipping, and operating railways and other lines of transport the United States has benefited from the leadership of great men, has had a large and efficient labor force, has commanded adequate capital, and has profited from both state and Federal aid. It has had the advantage of competition among the railroads and of competition of the railroads with other kinds of transportation. Each decade of our history has witnessed some major improvement; in fact, our nation has grown as our transportation facilities have grown. This growth is summarized in Figure 88.

Railway Transportation. Since 1840 the story of the United States has been in large measure the story of its railroads. As the one has developed, so has the other. At present the total mileage is about 246,000, each state having a share. It takes more than 54,000 locomotives, more than 2,000,000 freight cars, and more than 48,000 pas-

Period	Characteristics
1607–1790	Sailing vessels brought settlers and carried goods to and from Europe; small craft plied coastal waterways; rough postroads extended to inland points.
1790–1840	Great increase in American sailing vessels; "Golden Age" of American water-borne commerce, more than 80 per cent of our commerce carried in American ships. Many highways built; by 1811 National Pike extended from Washington to Ohio River; country contained 37,000 miles of postroad. In 1826 Erie Canal opened Great Lakes area to settlement; great public interest in canals led to construction of more than 5000 miles. Early steamboat period on Ohio and other rivers. Experiments with locomotives and railroads.
1840–1861	Fast American Clipper ships brought sailing ships to their greatest service and importance. Transatlantic steamship service inaugurated in 1846. Railroads built to most important points in Eastern United States: Boston to Albany by 1841; two lines extended from Buffalo to Chicago by 1853; Mississippi River reached in 1856. Great increase in steamboat service on navigable rivers.
1861–1865	Civil War; end of war found United States with largest and most powerful navy in world.
1865–1900	Decline of sailing vessels and wooden ships; iron ships came into use after 1870; later came steel ships; decline of American interest in oversea shipping; gradual growth of coastal and Great Lakes fleets under American flag. First sleeping car in 1863; first railroad to Pacific Coast in 1869; other transcontinental lines followed; branch lines filled in railway net in East; individual lines combined into large systems. Wagons employed for short hauls; horse-drawn carriages used for personal transportation in cities and in rural districts where roads were good enough; elsewhere people rode horseback; bicycle decade, 1890–1900.
Since 1900	Introduction of automobile and modern highways; in 1900 there were less than 4000 automotive vehicles; 29,705,220 registered in 1937; modern bus and truck transport established. World War left United States with large merchant marine and led to larger oversea trade in American ships; Panama Canal, opened in 1914, led to great development of intercoastal traffic and to operation of American ships around the world. Railroads made great technical advances; built double tracks; reduced curves; eliminated heavy grades and many grade crossings; built new bridges and tunnels; installed mechanical signaling systems; laid longer, heavier rails; built union stations and great terminal yards; introduced streamline and air-conditioned trains; placed trains on faster schedules; integrated train, bus, and truck service. Development of aviation followed first flight of heavier-than-air machine in 1903; airplanes used in World War; following the war came period of experimental flights and air-mail service; Atlantic Ocean flown; commercial aviation developed after 1928, when American companies began to bid seriously for passengers; now have service between leading cities of United States and to South America, Europe, and China.

FIG. 88. Periods in the development of transportation in the United States

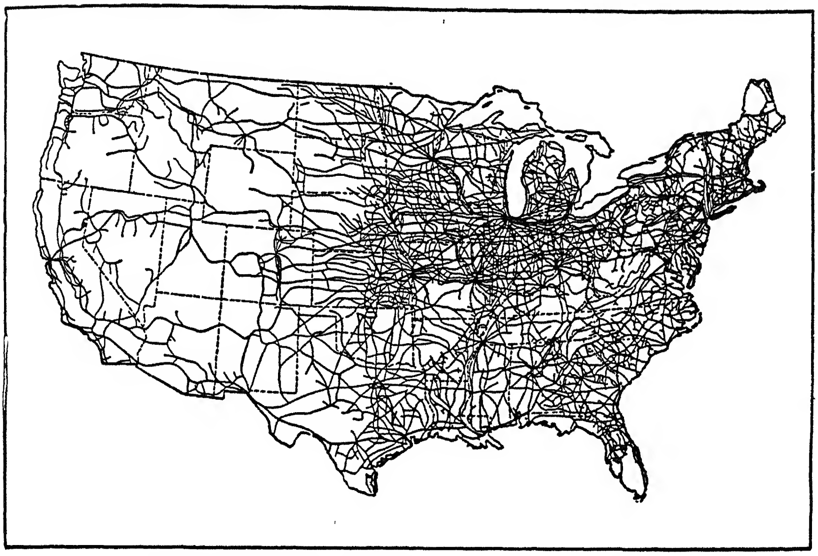


FIG. 89. The railroad pattern of the United States

senger cars to handle the traffic which flows over these lines. The railroads employ upward of 1,500,000 people and thus support a considerable part of our population.

Pattern. Railways are broadly but not evenly spaced over the country (Fig. 89). In the eastern half they are much more closely spaced than in the western half. In the eastern half too the spacing is closer north of the Ohio and Potomac rivers than south of those streams. Broadly speaking, the country is divided into three operating districts. The eastern district includes the area east of Chicago and St. Louis and north of the Ohio and Potomac rivers, whereas the southern district covers the territory south of those rivers and east of the Mississippi. The western, or transcontinental, district extends westward from Chicago, St. Louis, Memphis, and New Orleans to the Pacific. For some purposes, New England is considered to be an operating unit by itself.

Highway Transportation. Less than forty years ago a famous teacher of economic geography said: "As compared with Europe, the United States has no good roads. When it rains we stay at home or get stuck in the mud." Today the primary state highway systems, taken together, include more than 340,000 miles of highway—nearly twice that of any other country, and about equal to that of all Europe.

Most of these primary highways are improved with some form of surfacing—gravel, sand-clay, macadam, concrete. They reach every city and almost every village and tap most rural sections.

The highway pattern. As might be expected, all-weather highways are more numerous in well-settled sections of the country than in sparsely settled sections. Eastern United States shows a closer network than Western United States (Fig. 90). Highways are few and far between in the Great Basin and neighboring high, dry plateau regions of the Southwest (Fig. 69). In all parts of the country the highways focus on the major cities; for example, the highways of Indiana focus on Indianapolis. Many states display a well-marked gridiron of east-west and north-south highways. In fact, the east-west and north-south arrangement holds true in general for the whole country. The effect of the Great Lakes on the highway pattern is shown by the way in which the through roads from Minnesota and Wisconsin run around rather than across Lake Michigan, and by the fact that, except at the south, motorists can drive into Michigan at only a few points. As a rule mountain or hilly areas, such as the Adirondack section of New York or the Ozark Highland in Missouri, have fewer and more winding highways than neighboring lowlands. Stream valleys, steep slopes, and swamps account for many irregularities in the highway pattern.

Building and maintaining highways. Our highways are built and kept in shape largely by county, state, and Federal organizations. In most cases city streets and parkways come under the jurisdiction of the city governments. The county highways are used mainly for local traffic, thus leaving state-wide and national highways to the state and Federal governments. In most states a well-organized highway commission builds and maintains the state highways. The Federal authorities, through some form of Federal aid, try to bind the state highways into a national system. To this end, each of the main Federal arteries carries its own route number from coast to coast or from the northern border to the southern.

Effect of good roads. Good roads and the automobile brought many new things into the American landscape. In the early days motorists had to carry gasoline or run a chance of finding it in some wayside store. Now the attractive filling station, with its courteous attendants, appears at short intervals along our roads. According to a recent estimate there are about 320,000 filling stations in the country.

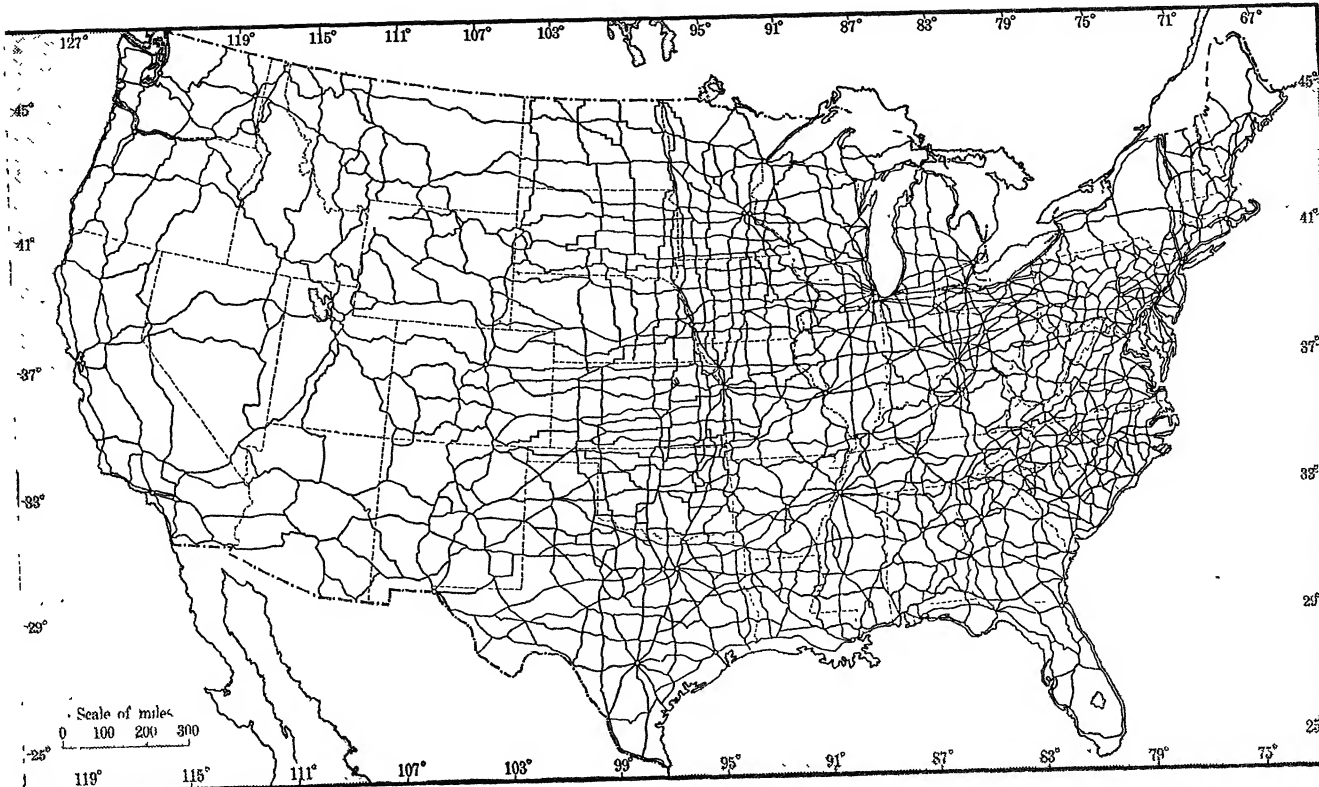


Fig. 90. Major arteries in the highway pattern of the United States

Roadside lunch stands—in many cases under the same management as the filling stations—play their part in making America "a nation on wheels." In some states, notably Michigan, wayside tables and small camping parks encourage tourists to picnic along the way. The increased travel due to the use of the automobile led to a great interest in hotels, and now most towns and cities have comfortable, well-managed hotels. In the early days some tourists carried a camping outfit and camped along the road; now there are well-managed cabin camps in nearly all parts of the country. In the East and other sections where large houses were the rule of a former day, many homes have been opened to overnight paying guests. All this means that travelers may cross the continent and each night find the type of accommodation they prefer.

Safety and beauty. Our interest in road-building has passed through several stages. At first we wanted surfacing so that the roads could be traveled in all kinds of weather. Then we wanted wider roads, with curves and grades adjusted to permit of greater speed. Now we are becoming interested in safety and beauty. Along many of the highways in some states the roadsides are kept clear of weeds and are improved by landscape grading, seeding, sodding, and planting. The modern idea also is to eliminate, for greater safety, all signs except those directing traffic. In time it is to be expected that the great American highways will become well-built, safe, and beautiful arteries of a great nation.

Highway traffic. Our road maps indicate the route numbers and the kind of surfacing of our highways, but they do not show the amount of traffic to be expected on a particular road. The Lincoln Highway in western Utah averages less than a hundred vehicles a day; yet it looks as important on the maps as the busy superhighways in the vicinity of our largest cities. Every road, however, is important in its locality, and the road passing our front door probably touches our lives more than any other transportation facility. The private automobile is by far our greatest means of passenger transportation. Authorities estimate that private automobiles handle about 94 per cent of the passenger traffic of the United States, leaving only 6 per cent for railways, busses, and airways.

The construction of state and interstate highways led to widespread use of trucks and busses, the former competing with the railways for freight traffic and the latter for passenger traffic. Trucks

are much used in local hauling by farmers, transfer agencies, coal, lumber, and construction companies, and others. Trucks are also employed in long-distance hauling, especially by companies operating large fleets of trucks. On the whole, experience has shown that railroads are better suited for hauling full carloads over long distances, whereas trucks handle small lots faster and more cheaply for distances of from 5 to 200 miles. In recognition of this fact some of the railroads now own fleets of trucks or maintain joint service with a trucking company.

Regular bus service is available in most parts of the country. Its major importance is for short-distance travel, such as between a city and a suburb or between neighboring towns and cities. Large, comfortable busses, however, are operated in long-distance service. Here, again, competition with the railroads has led to the establishment of bus service by some railroads or to a joint service by bus and rail. Many busses now carry mail, some villages and towns receiving all their mail in this way.

Air Transportation. Speed is the major contribution of the airplane to transport. An average of three miles a minute, or 180 miles an hour, is common along the world's air routes, and the traffic moves even faster on some lanes. At present mail, passenger, and express traffic produces the revenues for the commercial airways. Where the flow of this traffic is large and the distance long enough to give the planes a chance to show their speed, the airplane is certain to be found. When services from New York to Washington, from London to Paris, and from Moscow to Leningrad were established, they soon showed their worth. On longer routes, where the great speed of the airplane cuts traveling time from days to hours, as between London and India or Singapore, the planes get an increasing part of the traffic.

In quite another type of service the airplane is proving its worth. In Alaska, Northern Canada, Siberia, and other frontier areas with little or no organized land transport, the airplane is called into service. Railroads could not possibly pay in these vast expanses of tundra, swamp, and barrens; but air transportation does not call for roadbuilding, and thus the airplane can reach the isolated settlements at relatively low cost. In western South America air service is maintained to high Andean valleys that are not reached by railways or even highways. The airplane by no means confines itself to easy

jobs. It is a wonderful instrument for exploration and makes settlements possible in otherwise unprofitable places.

Effect of weather and land surface. The weather and the nature of the land surface are both of great significance in air transportation. In order to be satisfactory, air service must be regular and reliable. Granted a well-managed company, a well-trained staff, and modern equipment, regularity would still depend primarily on air conditions, namely, the weather. As we have learned, the weather is highly variable in the United States and other middle-latitude countries. To meet these weather hazards, blind, or controlled, flying has been developed. This, however, calls for an expensive ground organization and a continuous weather service. Such things cost money and emphasize the need of much traffic if the service is to pay for itself.

Experience thus far gained tends to show that airplane services can be maintained more satisfactorily in low latitudes than in middle or high latitudes. Weather is less variable in low latitudes, and this in part explains the fine services offered in Tropical America and in Southeastern Asia. In middle-latitude lands, like the United States and Western Europe, flying conditions rank from medium to poor. In the polar regions the weather is so variable that flying conditions run from bad to completely prohibitive. All this calls for much more precise knowledge of weather than we have had in the past. That "knowledge is power" certainly holds true in air transportation.

Within the United States certain large natural features have a marked bearing on air transport. In the country as a whole the major flow of traffic is east and west, whereas the major mountain areas trend north and south. The Appalachian Highland, the Rocky Mountains, and the Sierra-Cascade ranges thus lie across the path of important air routes. Flying over these uplands of necessity must be confined to well-marked routes—routes which as nearly follow the shortest distance as the position of the mountain passes will allow. Note, for example, how both the transcontinental railways and the air routes avoid the high Southern Rockies (Figs. 91 and 92).

From the standpoint of climate the southern border of the United States, south of the major storm tracks, is better suited to air transport than the rest of the country. The Pacific Coast, with its long, dry, storm-free summer, has a distinct seasonal advantage (Fig. 116), although in winter fogs and storms make regularity of service in that area more difficult. Level land and relative freedom from fogs

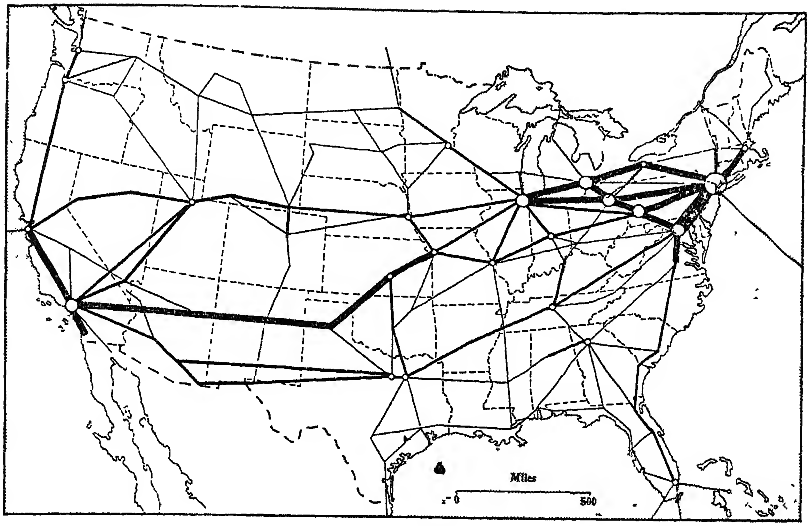


FIG. 91. Air routes of the United States. The width of the lines indicates the amount of service; the size of the circles the relative importance of the airports

are favoring conditions in the Middle West, but are offset in part by winter blizzards and summer storms. The Atlantic Seaboard, with its rapid weather changes and its heavy rainfall, will always be a challenge to air transport (Fig. 70). Better methods and greater care are the toll which must be paid in such areas.

Airways in the United States. The air lanes connecting the major cities of the country (Fig. 91), as might be expected, are farther apart in the West and South than in the Northeast, where large cities are numerous. The major lanes extend east and west with the principal flow of traffic. New York and Washington in the East are the major centers, the port of New York being the busiest airport in the world. Chicago leads in the Middle West, with Cleveland, Detroit, and St. Louis close behind. In the Western mountains the lanes focus on Salt Lake City; and Los Angeles, San Francisco, and Seattle dominate the Pacific Coast.

Airways and services to foreign countries. Miami is notable as the major airport gateway to Latin America. From it four lanes lead to West Indian and Caribbean points, two of them continuing into South America. Service to Mexico and Central America is offered from Texas and from California. An American company maintains transpacific service to China via the Hawaiian and Philippine

Islands and to Australia via Hawaii. In China, it was largely responsible for the establishment of air service up the Yangtze Valley. Service across the stormy North Atlantic to Europe is in the experimental stage, being developed under the co-operation of the United States, Canada, Newfoundland, Ireland, and Great Britain—all countries along the shortest route.

Advantages of the United States in air transportation. As compared with most countries, the United States has some definite advantages in air commerce. The long-distance passenger, mail, and express traffic is much larger than that of any other country, and thus the planes should get plenty of business if they offer satisfactory service. The great extent of the area under one government is another great advantage. The airplane can travel so far in a short time that it must have room to show its full worth, and this it has in the United States. Air traffic in Western Europe, on the other hand, is hampered by the small size of the countries. Since each country controls the air above it, a plane of one country cannot fly across another country without permission. Each country is anxious to develop its own services, and a company wishing to offer service to distant points may find it difficult, or even impossible, to get the necessary permission. British planes en route to India, for example, must pass over many countries and must have permission from each of them. Within their own territory the American companies run into no such difficulties, though oversea services call for working arrangements with foreign governments.

Air transportation in its present stage of development gives American exporters an advantage of time over their European competitors in trading with South America. The arrangement of islands and peninsulas in Middle America is such that planes offering services to connect New York and Chicago with Rio de Janeiro and Buenos Aires fly only short distances over water (Fig. 33). As yet the broad stretch of Atlantic waters has been spanned by only a few regular air services. Therefore many South American firms can send their orders by air mail to the United States and get their goods more quickly than if they had ordered from Europe. American salesmen can work their South American territory in much less time than formerly. The exchange of ideas between North and South American countries is made easier, and the countries of the New World are brought into closer and more sympathetic relations.

Water Transportation. Water transport is characterized by low cost rather than by speed. In our oversea trade every kind of traffic moves in ships, and we have shipping connection with practically all parts of the world. Except on the high seas, our vessels carry heavy or bulky freight at cheap rates, leaving the passenger, mail, express, and light freight traffic to other carriers. Traffic on the Great Lakes consists mostly of grain and iron ore down the lakes and coal up the lakes. On the Mississippi and Ohio rivers 90 per cent of the traffic consists of coal and coke, sand and gravel, petroleum products, and logs and lumber. Coastwise and intercoastal traffic consists of relatively cheap products which take up a good deal of space on the ships. The Panama Canal has led to marked reductions in water rates between our east and west coasts. The traffic from the Pacific to the Atlantic is about three times that in the opposite direction. Canned goods and lumber loom large in the eastbound traffic; but other important commodities are wheat and flour, crude and refined oils, sugar, fruits, vegetables, and wood pulp. From the Atlantic, iron and steel, cotton, metals, lubricating oils and greases, phosphates, sulphur, and general merchandise are the leading items. About 20 per cent of the traffic moves in tank steamers belonging to the oil companies.

2. *Transportation in Western United States*

The Problem of Transcontinental Transportation. In the United States and in Canada also the establishment of transportation between the East and West has been one of the major commercial problems. Distances are long, and much of the area between the Middle West and the Pacific Coast is sparsely settled. The shortest rail route from St. Paul to Seattle is 1775 miles, and from New Orleans to Los Angeles it is 2000 miles. The routes lie across vast wind-swept plains and arid plateaus, over deep canyons, and through high mountain passes. The summers are hot, and in winter snow blocks the mountain passes. At times cloudbursts and landslides occur. In some places the railroads cross stretches of desert which yield scarcely a ton of freight. Such conditions make it difficult to maintain regular service at reasonable cost. That this is done represents a triumph of modern transportation.

Transcontinental Groups and Terminals. In the United States the routes between the Middle West and the Pacific Coast divide into three groups—northern, middle, and southern (Figs. 90, 91, and 92).

The northern group is made up of three railroads (1, 2, 3 of Fig. 92), two highways, and one airway, and connects the Pacific North-

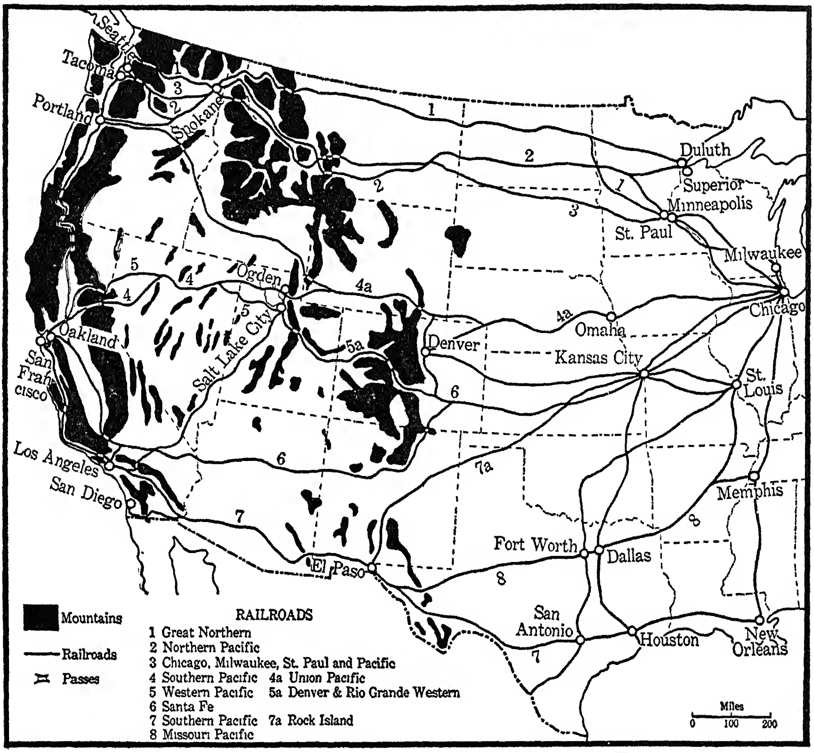


Fig. 92. Main lines of the transcontinental railroads in the United States

west with points on the Upper Mississippi and the Great Lakes. Portland, Tacoma, and Seattle are the western terminals, and Minneapolis–St. Paul, Duluth–Superior, Milwaukee, and Chicago are the eastern terminals.

The middle group consists of two railway routes (4-4a and 5-5a), two famous highways, and a transcontinental airway. San Francisco is the western terminal (Fig. 93), Chicago (Fig. 94) and St. Louis are the eastern terminals, and Omaha, Denver, and Salt Lake City are important intermediate points.

The southern group is made up of the transportation services over two distinct routes. At the west both these routes terminate in Southern California; but at the east one leads to the Middle West and the other leads to the lower Mississippi country. The first route

is followed by a railway (6), an airway, and a highway connecting Los Angeles and San Diego with St. Louis and Chicago; the latter by a railway (7), an airway, and a highway connecting Los Angeles and San Diego with New Orleans. Los Angeles and Chicago also are connected by through railway service via El Paso (7–7a), and Los Angeles is connected with Memphis and St. Louis via El Paso, Fort Worth, and Dallas (7–8).

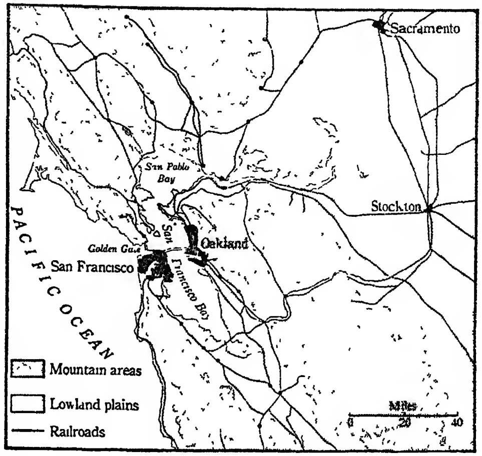


FIG. 93. Transportation in the San Francisco district

Traffic and the Industries and Areas Which Produce It. The traffic on the Western railroads is in part through traffic between the Pacific Coast and the Middle West and in part traffic to and from the intervening centers such as Denver and Salt Lake City. The passenger traffic is mainly of the first type, being especially heavy between Chicago and Los Angeles and San Francisco. The freight traffic is principally of two sorts: commodities from the productive districts along the railways, and commodities shipped from the eastern half of the country. Shipments from the East consist largely of manufactured goods to be used by the people of the West, but they include smaller quantities of commodities moving to Japan, China, and the Philippine Islands by way of our Pacific ports.

The freight produced in the West comes largely from the mining, lumbering, agricultural, and grazing districts of that part of the country. As the major cities are associated with these freight-producing districts, the map showing the distribution of cities (Fig. 68) reveals also where most of the freight comes from. Denver, Spokane, and the other large cities are commercial centers for mining districts (Fig. 77), and some of them, such as El Paso, Los Angeles, and Tacoma, are smelting or refining centers. Thus the cities are also traffic centers. Most of the long-distance shipments of lumber originate in the forests of Washington, Oregon, Northern California,

and the Northern Rockies (Figs. 76 and 69). Grain and livestock from the Great Plains and the Columbia Plateau are shipped in large quantities. Grazing is the most widespread industry in the West; but since the grazing lands are mainly semiarid or desert, there is not sufficient grass to fatten the stock. Alfalfa is raised by irrigation wherever possible, and the cattle are fattened on this nutritious crop. In addition some stock are shipped to the fertile Middle West to be fattened. Here is another source of traffic for the Western roads. Finally, the irrigated districts of the Pacific Coast and the Southwest ship large quantities of fruits and vegetables to Eastern markets.

3. *Transportation in Eastern United States*

Big Features of the Railway Pattern. The railway pattern of Eastern United States is so complex that one must begin with its big features in order to understand it. In the first place, as has been stated before, Eastern United States contains two railway districts: an Eastern District north of the Ohio and Potomac rivers and a Southern District lying south of those rivers. In the second place, the major lines of the Eastern District extend east and west, whereas those of the Southern District crisscross, some lines extending from southwest to northeast and others from northwest to southeast. The east-west lines of the Eastern District are often called "trunk lines." In the third place, the number of railway lines in Eastern United States is so large that they cannot be named on a map of convenient scale. These larger features can be understood by first looking east, south, and southeast from Chicago and then noticing certain additional features peculiar to the Atlantic Seaboard.

Routes from Chicago. Chicago has a normal traffic of about 21,000 freight cars per day—more than New York and St. Louis combined. Some cars bring in products to be used or manufactured in the city, but many of them are destined for other parts of the country. This exchange of cars from Western lines to Eastern lines and vice versa is carried on by short belt lines which connect all railroads entering the city (Fig. 94). After the cars are exchanged they are made up into trains and routed to other parts of the country.

From Chicago the St. Lawrence Corridor, the most northerly of Chicago's three routes to the Atlantic, leads eastward via Lake Erie, Lake Ontario, and the St. Lawrence to the sea (Fig. 95). East of

Detroit this nearly level pathway narrows and lies between highlands at the north and south (Plate III). From Chicago two railways and through highways extend down the corridor to Montreal and Quebec (8 and 9 of Fig. 95): the Canadian National via Port Huron and the Michigan Central-Canadian Pacific via Detroit. The lakes and the St. Lawrence River furnish a waterway along the corridor. Navigation is interrupted by Niagara Falls and by five sets of rapids between Lake Ontario and Montreal, but canals lead around these obstructions. Ice closes the water route during five months of the year, thus reducing its usefulness.

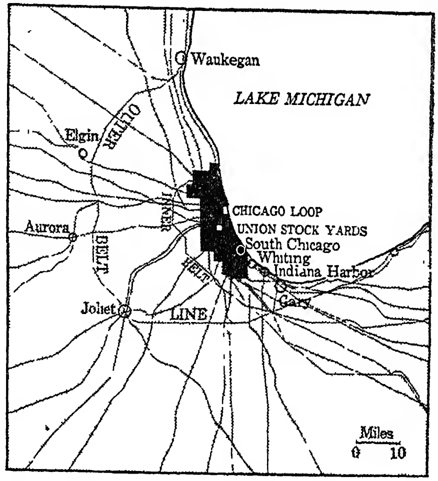


Fig. 94. Chicago, a railway center at the head of Lake Michigan. The area of the city is shown in black

A second route extends from Chicago to New York via Buffalo and the Mohawk-Hudson valley. This is the route of the New York Central System, one division of which runs north of Lake Erie and one south of it. This system has an almost level route to the sea; for in crossing the Appalachian Highland east of Buffalo, it follows the low-cut valley of the Mohawk and Hudson rivers. Paved highways and well-marked airways (Figs. 90 and 91) parallel the railways, as does the New York Barge Canal eastward from Buffalo, thus making the route one of the busiest in the country.

A third link in the transport pattern of Eastern United States leads from Chicago and St. Louis across the Appalachian Highland to New York via Pittsburgh. This is a broad way rather than a single route and is followed by the main lines of the Pennsylvania and the Baltimore & Ohio systems. Trains must climb to about 2300 feet in crossing the highland, but they are repaid by the rich traffic in coal and steel which the highland offers. Highways and airways also follow this general path.

From Chicago southward a natural route leads down the Mississippi Valley to New Orleans and the Gulf of Mexico. This route is

followed by the Illinois Central Railroad and by two highways, an airway, and a waterway (Figs. 90, 91, 95 and Plate III). The Illinois Central follows an almost level route from Chicago to St. Louis, Memphis, and New Orleans. It thus comes in direct contact with most of the railway systems of the country. By means of a canal small boats can reach the Illinois River from Lake Michigan and thus gain the Mississippi Route to the sea. Little or no traffic follows the northern part of this waterway; but south of St. Louis the Mississippi River is an important means of transport for slow-moving freight.

From Chicago to the southeast, through rail service is maintained to Gulf points and Florida along three lines; via Evansville, via Louisville, and via Cincinnati. In each case, however, a through train runs over the tracks of several railway systems. Main highways lead southward through the same points on the Ohio, and air service is offered by way of Louisville, Nashville, and Atlanta.

Routes of the Southeast. The northwest-southeast lines from Chicago to Florida and other points in the Southeast are crossed by lines extending from New Orleans and Gulf points to Washington and the Northeast. Two Southeastern systems stand out. The first is the Southern Railway, with its main line from New Orleans via Atlanta and Piedmont cities to Washington. The other is the Atlantic Coast Line, which extends from Florida northward along the coastal plain to the city of Washington. Highways and airways follow much the same pattern, and numerous shipping companies offer coastwise service by sea. From Washington much of the land traffic carries on to New York. Railways, highways, and air services from New York lead northeast to Boston and New England points, north to Montreal and Canadian points, and northwest to Buffalo and the Great Lakes country.

Eastern Railway Centers. The railroads of Eastern United States are so numerous that almost every city is a railway center (Figs. 89, 95 and Plate II). On the Atlantic slope, however, three cities—New York, Washington, and Atlanta—stand out. All lines in the Eastern Seaboard converge on New York; Washington is the point of contact of the Southern systems with the Eastern systems; Atlanta stands at the southern tip of the Appalachian Highland, and railways radiate east, south, west, and northwest from it. Westward from the Atlantic slope, railways converge on several cities. Among these are Buffalo, at the foot of Lake Erie; Pittsburgh, commanding the great

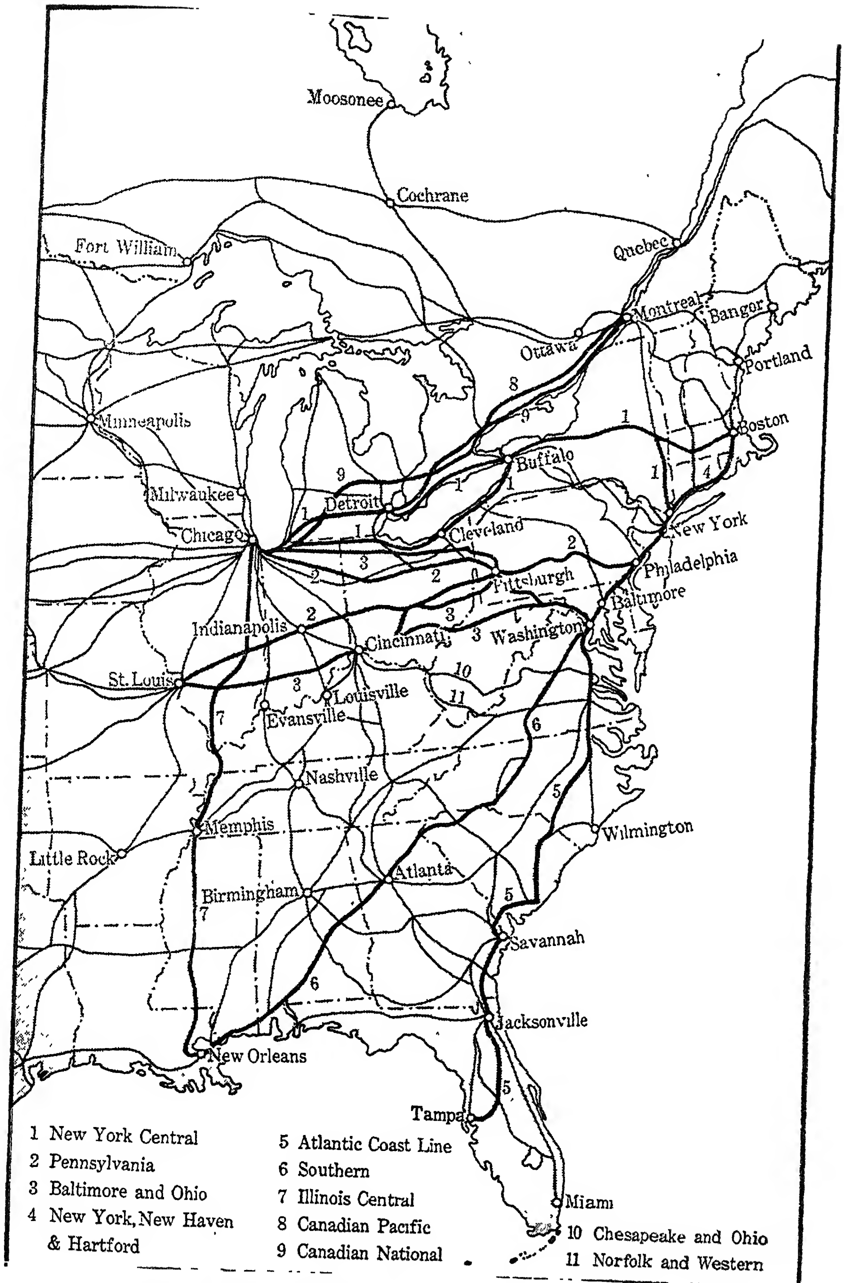


Fig. 95. Major railway routes in Eastern United States

mining and manufacturing districts of Western Pennsylvania; and Birmingham, in the principal iron and steel district of the South. Still further west, Cincinnati and Louisville, as has been previously stated, are points of contact for Southern lines with the trunk lines; and Chicago, St. Louis, Memphis, and New Orleans are the points of transfer from east to west.

Traffic. The transportation facilities of Eastern United States carry enormous quantities of freight, express, and mail, and great numbers of passengers. This seems logical when one remembers that Eastern United States contains 85 per cent of the people of the country; produces most of the manufactured goods; mines most of the coal; and buys a large part of the products shipped from the farms, ranches, and forests of the whole country.

QUESTIONS

1. For each of the six periods in the development of transportation shown in Figure 88 what types of transport were available; and what new type or types appeared in that period?

2. In which period were the railroads consolidated into railway systems? How was this an advantage to the country?

3. In your opinion what is the importance of our railways in handling (1) our long-distance freight traffic and (2) our local passenger traffic?

4. Name the railway operating districts of the United States. Which serves the largest number of large cities (Fig. 68 and Plate II)?

5. What conditions help to explain the irregularities in our highway pattern?

6. In what ways can travel on our highways be made safer?

7. In what two types of service is air transport especially useful?

8. In what ways does weather affect air transportation?

9. In what ways may air transport affect our relations with other countries?

10. What is the significance of the Hudson-Mohawk Valley in transportation?

11. What is meant by the St. Lawrence Corridor? What railways follow it? During how many months of the year can the St. Lawrence River be navigated? Why not during all the year?

12. What advantage has the New York Central over the Pennsylvania Railroad? What advantage has the Pennsylvania over the New York Central?

13. What is the significance of Atlanta in railway transportation? Buffalo? Washington, D. C.?

EXERCISES

1. *What a freight car holds*

More than 2,000,000,000 tons of freight are moved by steam railroads in the United States every year. This amount is so large that it lies beyond our sense of measurement. If it were loaded all at one time, more than 50,000,000 freight cars would be required to move it. Actually, there are about 2,500,000 freight cars in service, and during the course of a year these cars move the freight of the country. The amount carried by a single car, if full, varies with the capacity of the car and with the nature of the goods. The average capacity of the several classes of cars and the number in use in a recent year are as follows:

Class	Number	Average Capacity (Tons)
Box	1,059,296	36
Flat	109,867	38
Stock	84,556	33.5
Coal	949,931	48.9
Tank	9,714	41.2
Refrigerator	61,927	32.1
Other	85,711	46.0
	2,361,002	41.9

a. How many bushels of wheat can be shipped in a boxcar? (A bushel of wheat weighs 60 lb.)

b. Wheat production in the United States in a recent year averaged 13.6 bushels per acre. At that rate a boxcar would carry the product of how many acres? How many acres would be required to fill a train of 50 cars?

c. In a recent year, Saskatchewan produced 240,000,000 bushels of wheat. How many trains of 50 cars each were required to carry this crop to market?

d. Some of the larger coal mines hoist, at times, 3000 tons or more of coal in a day. How many coal cars will be needed to move a day's output?

2. *Highway pattern of your state*

Secure a recent highway map of your home state and on it (1) indicate the location of your home town with a heavy black circle, (2) draw heavy red circles around the five cities which are the major highways centers, (3) draw heavy black arrows near the margin of the map to indicate the points at which the major U. S. highways enter the state, (4) note the section of the state where the highways are very close together and the sections (if any) where the highways are far apart. Shade the latter with your ordinary pencil. Add a legend to indicate what your colors and symbols mean.

CHAPTER XII

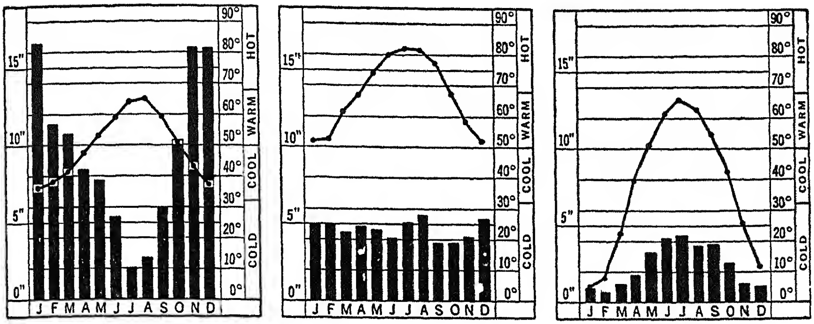
THE LUMBER INDUSTRY OF THE PACIFIC NORTHWEST

The rising curtain of a misty morning reveals anew the imposing majesty of these giant trees. — JOHN MUIR

1. *The Industry in the Region of Production*

Principal Lumber-Producing Areas of the United States. The huge quantities of lumber sold annually in the United States come principally from two producing regions, but scattered areas in many parts of the country furnish minor quantities. The Southeast and the Pacific Northwest contain more than half our present forest acreage and furnish nearly three fourths of our annual cut of lumber. The Pacific Northwest has a somewhat smaller forested area than the Southeast, but it ships more lumber and contains much the greater quantity of standing timber. In fact, the Pacific Northwest contains about 70 per cent of our remaining lumber resource. On the other hand, the forests of the Southeast, favored by the long summers of that area (Figs. 72 and 96), grow faster than those in any other section of the country. Forest fires cause losses in both the major lumber-producing areas, but they are particularly serious in the Pacific Northwest because the summers are dry and because the land carries a large amount of timber per acre.

Location of Pacific Forests. In general, the forests of California and the Pacific Northwest cover a strip of country from 40 to 200 miles wide, paralleling the Pacific Coast from San Francisco Bay northward into British Columbia (Fig. 97). In California the forests are confined largely to the Coast Ranges and the Sierra Nevada. However, in Washington and Oregon the forests extended originally in almost unbroken stand from the Pacific Coast eastward across the Coast Ranges and the Puget Sound–Willamette Lowland to the eastern slopes of the Cascade Mountains (Figs. 98, 99, and 100). These forests grow under particularly favorable climatic conditions. Cool, mild, humid weather prevails, just the type suited to forest growth. Most of the rain comes in winter; but the drier weather of summer does not last long enough to injure tree



CEDAR LAKE
Elevation above sea level, 1546 feet
Average annual rainfall, 113.85 inches

TENMILE
Elevation above sea level, about 50 feet
Average annual rainfall, 55.83 inches

VIRGINIA
Elevation above sea level, 1434 feet
Average annual rainfall, 28.92 inches

FIG. 96. Temperature and precipitation in three lumber-producing areas: Cedar Lake, Washington; Tenmile, Louisiana; and Virginia, Minnesota

growth. High winds and storms almost never occur, and many of the trees have passed the venerable age of five hundred years. Proud, lofty aristocrats of the plant world are they (Fig. 102)!

Forests of the Southeast. In Southeastern United States the forests extend in a broad belt along the coast from Texas to North Carolina and reach inland along the Mississippi River to Arkansas. These forests (Fig. 101) yield both softwood and hardwood lumber, and they are our principal source of naval stores. In recent years the forests of Texas and the states bordering the Mississippi have produced the greater part of the Southern lumber.

Much of the original forest has been cut and is being replaced by second growth. Recent experiments have shown how to utilize this quick-growing second growth in the manufacture of wood pulp and chemical products. The future of the forest industries in the Southeast, therefore, is likely to depend on second-growth timber and the chemical industries rather than on the lumber business. With the passing of the original forest in the Southeast and other sections of Eastern United States, the nation has turned more and more to the great forests of the Northwest for its lumber supply.

Importance of the Lumber Trade for the Pacific Northwest. Railway traffic across the Cascades (Fig. 99) suggests the large part which lumber plays in the dealings of the Pacific Northwest with other regions. In addition to cars loaded with products of farms and factories in the eastern half of the country, westbound trains haul many empty freight cars into Seattle and the other railway centers of

the Pacific Northwest. The empty cars and many of the other cars after they are unloaded are switched to branch lines and distributed to the sawmill towns. When the freight trains start eastward, however, the cars are in most cases loaded to full capacity. Probably two thirds of them carry lumber for Eastern markets. Carrying lumber is the principal business of the railroads in this part of the country, and a large proportion of the ships that sail from Washington and Oregon ports carry lumber. In fact, the lumber industry is the principal interest of the Pacific Northwest.

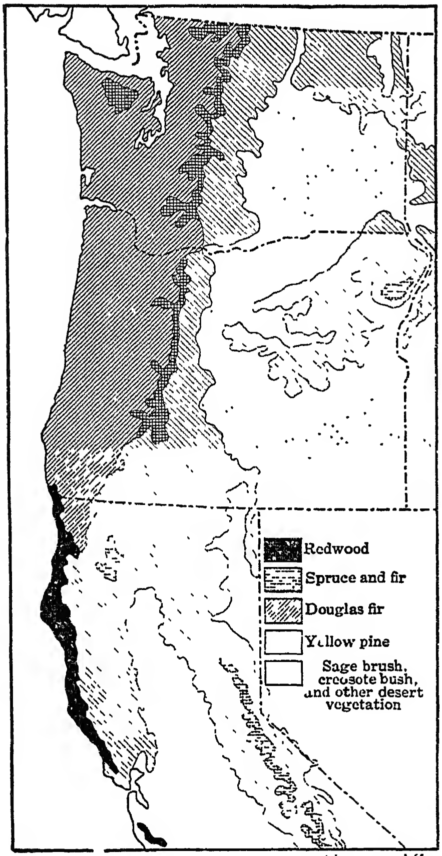


FIG. 97. Forests of California and the Pacific Northwest

Commercial Centers of the Pacific Northwest. In the Pacific Northwest the business of producing and shipping lumber centers about four cities: Seattle and Tacoma in Washington, Portland in Oregon, and Vancouver in Canada (Fig. 99). In Seattle are located the head offices of many of the lumbering companies operating in the western part of Washington. Here also are the wholesale houses that distribute supplies to the lumber camps and sawmill towns, the terminals of the transcontinental railways, and the banks which handle the financial part of large business transactions. From Seattle, Tacoma, Portland, or Vancouver, it is only a short ride by train, motor, or steamer to the forests. In these forests the production of lumber requires scores of sawmills, hundreds of lumber camps, and the employment of a veritable army of men.

What the Forests Are Like. Pacific Coast lumber comes from forests famous for beauty and lumber value (Fig. 102). Many of the

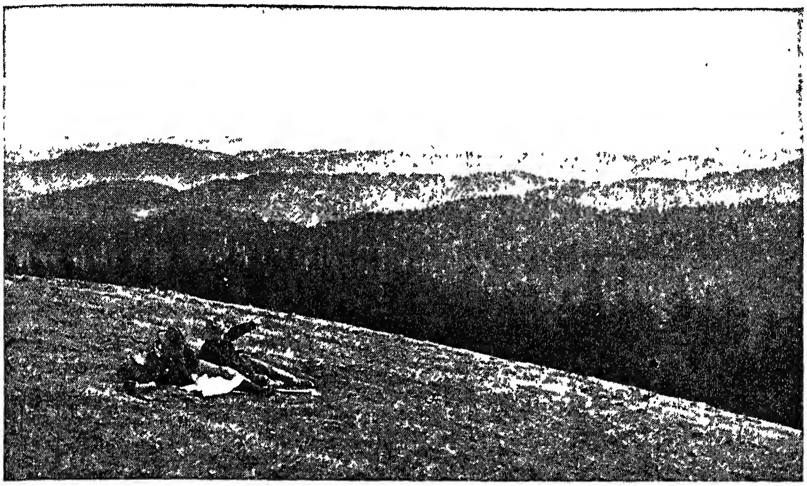


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FIG. 98. Coast Range in southwestern Oregon. Looking toward the Pacific Ocean across ridges heavily forested with Douglas fir, red cedar, Western hemlock, and Sitka spruce

trees have trunks eight feet or more in diameter, but they are so beautifully proportioned that they do not look as large as they are. The ordinary 200-foot trees of these Western forests rise to the level of buildings twenty stories high, and the real giants raise their heads a hundred feet higher. In some places there is an undergrowth of deciduous trees that, although they look small in comparison with the giant trees, really are as tall as the trees in an Eastern forest.

The Principal Species in Three Areas. From the standpoint of the lumber trade the forests of the Pacific Northwest divide into three sections. The first is the redwood belt of the Coast Ranges, extending from San Francisco Bay northward to about the Oregon boundary (Fig. 97). From this forest is cut the redwood lumber used in building houses and for interior finishing. The second section yields yellow pine and sugar pine, the most important stands of which are in the Sierra Nevada. The lumber cut from these forests is used largely in the central part of California. The third section is the Oregon–Washington–British Columbia area, where the Douglas fir, a fine structural timber, is the principal species. Of great impor-

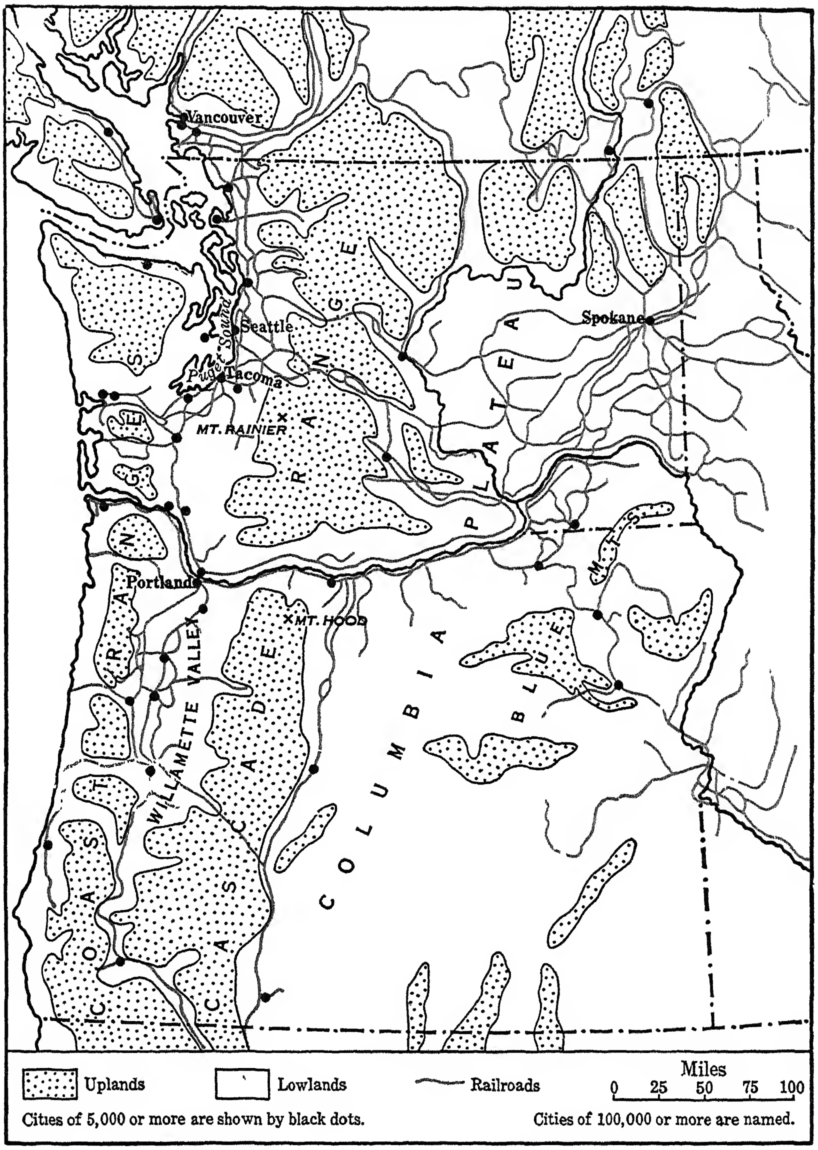


Fig. 99. Cities, railroads, and surface features in the Pacific Northwest

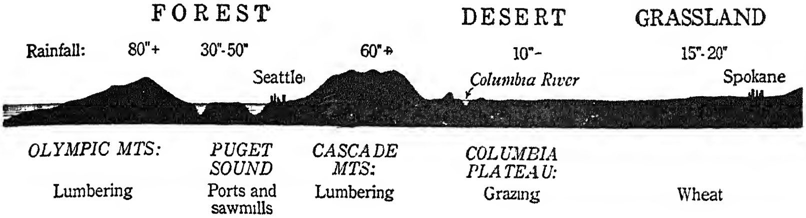


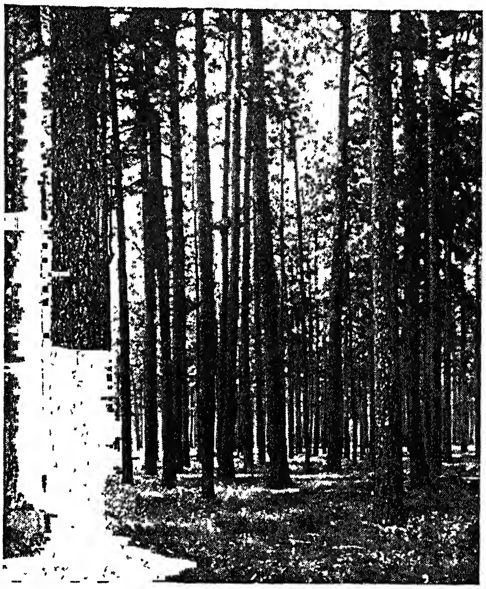
FIG. 100. Cross section of relief, rainfall, and native vegetation in Washington on an east-west line from the Pacific Coast through Seattle and Spokane to the eastern boundary of the state

tance also is the red cedar, a tree from which high-grade shingles are made. The Douglas fir is by far the most abundant of the commercial species.

The Lumber Industry Meets New Conditions. When the lumber industry expanded into the Pacific Northwest, most of the lumbermen came from the forests about the Great Lakes. They found that besides coming to a new region they had come in contact with new conditions. In the Great Lakes area the common practice had been to cut the trees in winter, when the ground was covered with snow. The logs were hauled on sleds to the frozen streams, where they remained until the ice melted in spring. Then they were floated downstream to the sawmills. These methods could not be used in the Pacific Northwest. The streams do not freeze, and there is no snow except in the high mountains (Figs. 96 and 116). Logs cannot be floated down to the mills; for the streams plunge over high waterfalls on their way down the steep mountain slopes and are choked with boulders in their lower reaches. Moreover, the old methods were not suitable for handling the huge trees of the Pacific forests.

Adapting methods to big trees. In establishing the industry in its new environment the lumbermen gradually found means of overcoming the difficulties. Because the trees are enormous a square mile of forest yields as much lumber as eight or ten square miles of Eastern forest (Figs. 9 and 102). Hence the logging camps do not have to be moved as frequently as in the East, and the companies can afford to install expensive apparatus for their logging operations. Longer and heavier crosscut saws are needed to fell the big trees. After the forest giants are felled, stripped of their branches, and sawed into logs, stationary engines skid them to the railway by

means of cables and load them on the flatcars. In the East a flatcar carries several logs, but in the West each of the larger logs requires a car. In the mills the ordinary saw could not cope with the huge logs, and a new type of saw was invented to solve the problem.



© Underwood and Underwood

Fig. 101. A virgin stand of longleaf pine at Ocilla, Georgia

Adapting practices to a rugged area. Two devices will serve to illustrate how logging practices have been adapted to the conditions of a mountainous area. Where slopes are steep, the logs are brought to the railway by means of a long cable known as a "skidding line." The cable is stretched from a tree high on the slope to one near the railway. The huge logs are attached to a carrier and are swung down the slope, in many cases crossing a canyon or two on the way. On steep mountain sides the lumber companies have in many instances built long troughlike flumes into which they have turned water from a stream to carry the logs down to the mills. One such flume in California is sixty miles long.

Work of the Sawmill. The sawmill is a factory in which the huge logs are manufactured into boards, siding, flooring, and larger pieces known as dimension stock (Fig. 103). A power-driven conveyor takes the logs from the water and moves them into the mill. Machinery moves them from one set of saws to another until they are cut into pieces of the desired sizes. Machinery sorts the slabs, and those which are suitable for making lath go to another set of saws. Waste pieces go to the boiler room to be burned for fuel or to the destructors to be burned as waste. Machinery loads the sawed lumber on specially constructed trucks, which it then pushes into the

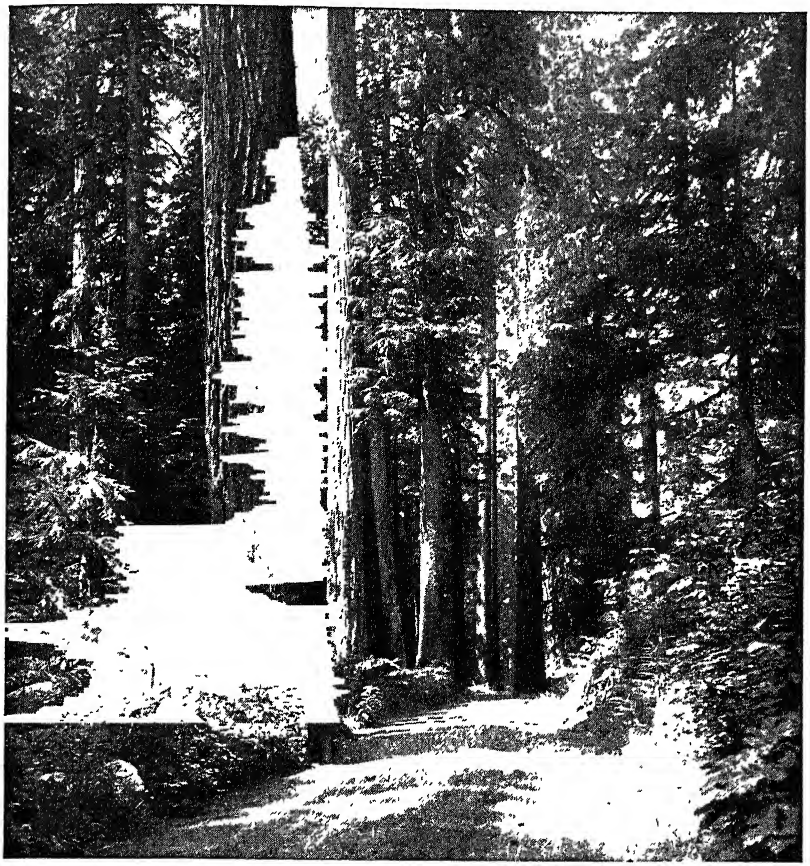


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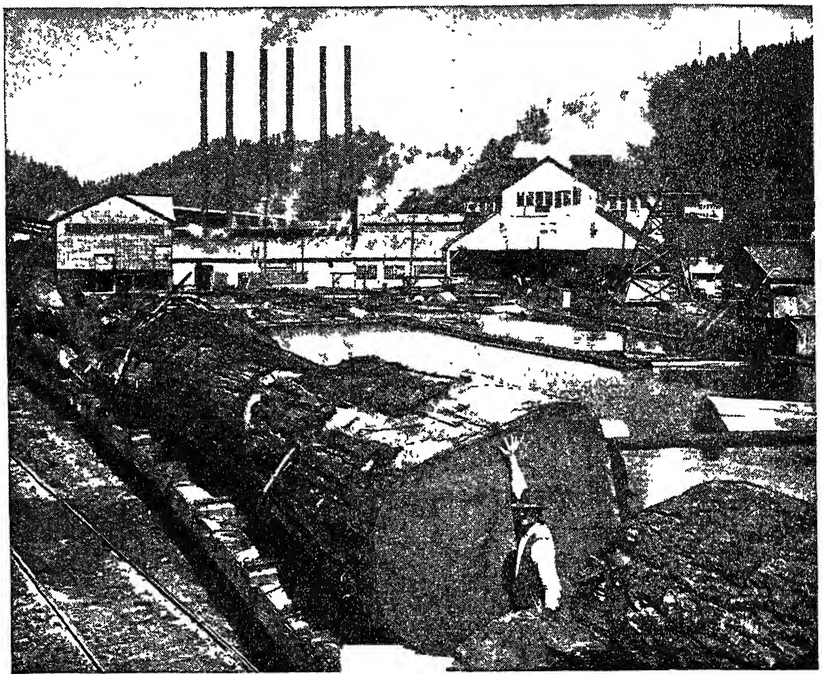
Fig. 102. A forest of Douglas fir near Tacoma, Washington. An acre of this forest yields from sixty to eighty thousand feet

drying kilns. Artificial heat greatly speeds up the process of seasoning, which formerly took several months. When lumber is to be shipped, machinery loads it on cars or ships.

Location of Sawmill Towns. The principal sawmill towns of Washington and Oregon are in three main districts. The first and most important group is about the shores of Puget Sound; the second is in the Grays Harbor–Willapa Bay district in the southwestern part of Washington; and the third is along the Columbia River (Fig. 104). These districts offer certain advantages which are not open to the small mills scattered elsewhere through the region.



Ewing Galloway, N. Y.

Fig. 103. A large sawmill on the Redwood Highway in northern California. Here redwood trees are converted into lumber

Value of location of sawmill towns on the lowlands. Most of the sawmill towns are on the lowlands rather than in the mountains. On the lowlands communication with the main railway lines can be established without great difficulty, and in many places the loaded logging trains are hauled downgrade from mountain forests to the mill, thus saving fuel. Most of the lowland towns are reached by state highways, and in some cases logs are brought to the mills by trucks. In addition, the towns on the lowlands have some advantages in securing food; for in most cases there are farms near at hand which furnish fresh vegetables, milk, and eggs.

Value of location of sawmill towns on a navigable waterway. Most of the lowland sawmill towns are located on arms of the sea or on navigable rivers. Frontage on a navigable waterway is an advantage both in receiving logs and in shipping lumber. From forests along the waterway the logs are rafted to the mills, and ocean-going vessels may load lumber directly from the mills. Columbia River towns have

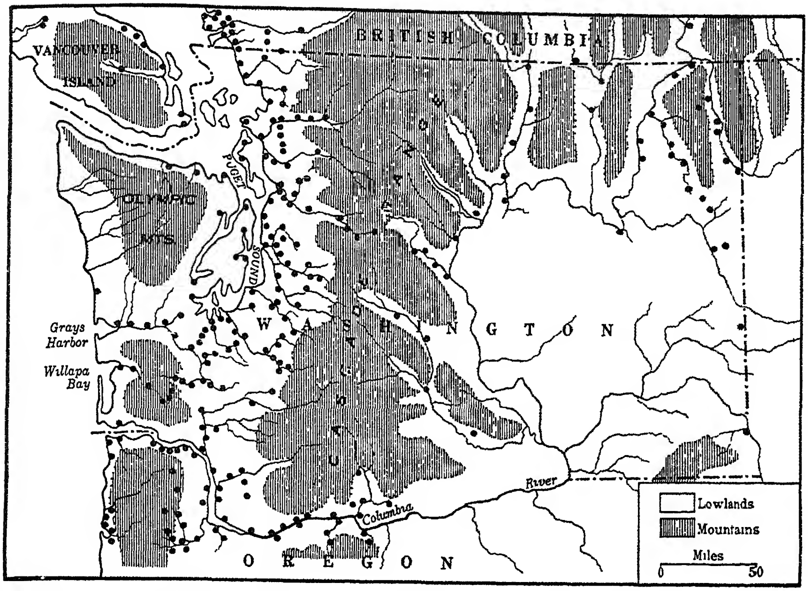


FIG. 104. Sawmill communities of Washington and the neighboring parts of Oregon and British Columbia

the advantage of steamship connection with Portland, and the sawmill towns on Puget Sound have similar transportation to Seattle or Tacoma.

Value of location of sawmills on the east shore of Puget Sound. In the Puget Sound district more sawmills are located on the east shore of the sound than elsewhere (Fig. 104). There they have ready communication with the sea and also with the transcontinental railways that enter the lowland by way of valleys leading down from the Cascades (Fig. 92). The main railways center at the ports of Seattle and Tacoma, and branch lines connect the sawmill towns with the lumber-shipping ports.

The Lumber Trade Stimulates Other Industries. Lumber interests many people in many lines of business. Besides the 82,000 men working in the logging camps, sawmills, and planing mills of the Pacific Northwest, it is estimated that some 25,000 others are employed in loading or hauling lumber on railroads and waterways and at lumber-shipping ports. In addition, interest in lumber extends to practically all lines of business in the region; and when the sawmills are busy, everyone else is busy.

Effect of sawmill towns on trade and manufacturing. Logging camps and sawmill towns create business for wholesale houses in the major commercial centers and for retail stores in scores of towns and cities. Thus other lines of business are stimulated when the lumber industry prospers. Much of Seattle's banking business grows out of the need for paying the thousands of bills connected with the production, sale, and shipment of lumber. Establishment of shops and factories has been encouraged by the need for special types of clothing and tools in logging camps and by the need for repairs and machine parts in sawmills. A larger development of manufacturing may come, particularly in view of the generous water-power resources of neighboring mountain ranges.

Effect of sawmill towns on agriculture. In the Puget Sound Lowland the lumber industry led to the development of agriculture. At an early date farms in the vicinity of the sawmill communities supplied milk, eggs, poultry, fruit, vegetables, and other foods. As mill town after mill town grew up on the shores of Puget Sound, farming communities also increased in number. The people in the towns depended on the farms for fresh foods, and the towns gave the farmers a near-by market for their produce and a place to buy clothing and other supplies. In time, however, both industries found an outlet for their products in distant places. Now many regions buy Pacific dairy products and fruits as well as Pacific lumber.

2. *The Lumber Industry in Its Relation to Other Regions*

Demand for Lumber. One who sees the extensive logging and sawmill operations of the Pacific Northwest, the hundreds of carloads of lumber sent eastward every day, and the shiploads sent out to sea, might wonder where all this lumber is used. Most of it is consumed in the United States; for the American market consumes nearly as much lumber as all the rest of the Commercial World. Our uses for lumber are many. Probably half our people live in wooden houses, and even the brick and stone houses of the cities require much wood in their construction. Vast numbers of trees are cut annually to provide telephone and telegraph poles. Many of our bridges and docks are supported by heavy wooden piles, and our railways require 125 million ties each year for their roadbeds. Woodworking

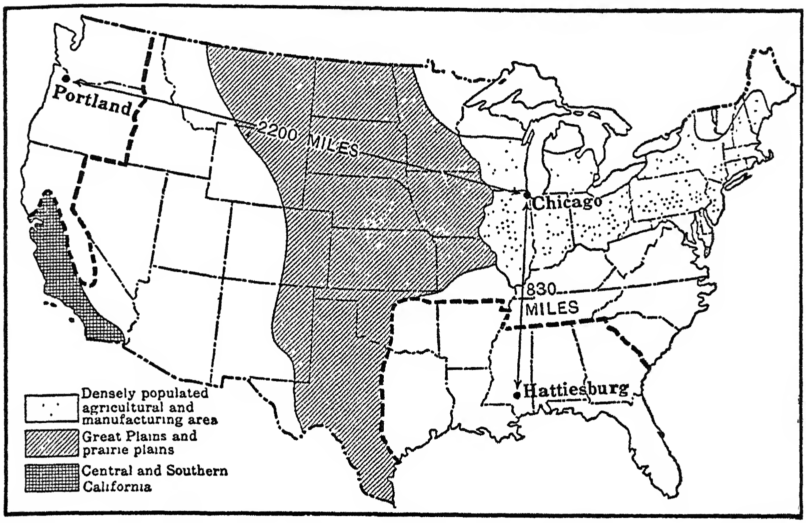


FIG. 105. Principal market areas for lumber in the United States. The heavy broken lines enclose the principal lumber-producing areas

industries use much lumber, and great quantities of props and cross-bars are needed to support the roofs of mines.

Principal Lumber-Consuming Regions in the United States. The densely peopled industrial area lying east of the Mississippi and north of the Ohio and Potomac rivers takes about half the output of our lumber industry (Fig. 105). Its lumber requirements are large; for it contains nearly 30 per cent of our farms and nearly two thirds of our big cities. It has a vast railway mileage and numerous ports, and it contains our leading coal-mining and manufacturing districts.

The second great lumber-buying area lies between the Mississippi River and the Rocky Mountains. The prairies of Iowa and adjoining sections of Missouri, Kansas, Nebraska, and southern Minnesota, as well as the Great Plains Region (Fig. 69), are large consuming areas. Having no forests, these important farming regions depend entirely upon lumber brought from the forested sections of the country.

Southern California, with its semiarid climate (Figs. 70 and 116), is another large market for lumber. Los Angeles and the other cities and towns of this section are growing rapidly and use much lumber for building purposes. Considerable quantities are made into boxes for shipping California fruit to Eastern cities, and the petroleum and motion-picture industries also need surprising amounts of lumber.

How Lumber Is Shipped. Lumber from the Pacific Northwest reaches consuming areas by both land and sea routes. Shipments go eastward by rail across the mountains. Some sea-borne cargoes cross the Pacific to the Orient, and others go through the Panama Canal and thence across the Atlantic to Europe, but most of the shipments by sea belong to our coastwise and intercoastal trade.

Rail shipments to interior markets. To the important markets of the Great Plains and the prairies of the Middle West, lumber goes by rail. In Washington the lumber shipped on four railways averages about 1300 carloads daily. Westbound trains on these railways carry many Eastern products for use in the lumber-producing states, and they also carry machinery, automobiles, and cotton for export to the Orient. Westbound freight, however, is less in volume than eastbound lumber, and the cost of hauling empty cars back to the Pacific Northwest forms one of the difficult problems of railway management.

Coastwise shipments to California. Lumber is shipped to Southern California at low cost because of the direct all-water haul. Ships load lumber at sawmills in the Pacific Northwest and deliver it at Los Angeles and San Diego close to the places where the lumber is needed. In summer huge cigar-shaped log rafts are towed by strong tugs from the Columbia River to San Diego, thus delivering logs to sawmills on the water front more cheaply than lumber could be shipped. This method of transportation is not suited to rough seas and consequently is successful only in summer, when our western coast is free from storms and the Pacific Ocean lives up to its name.

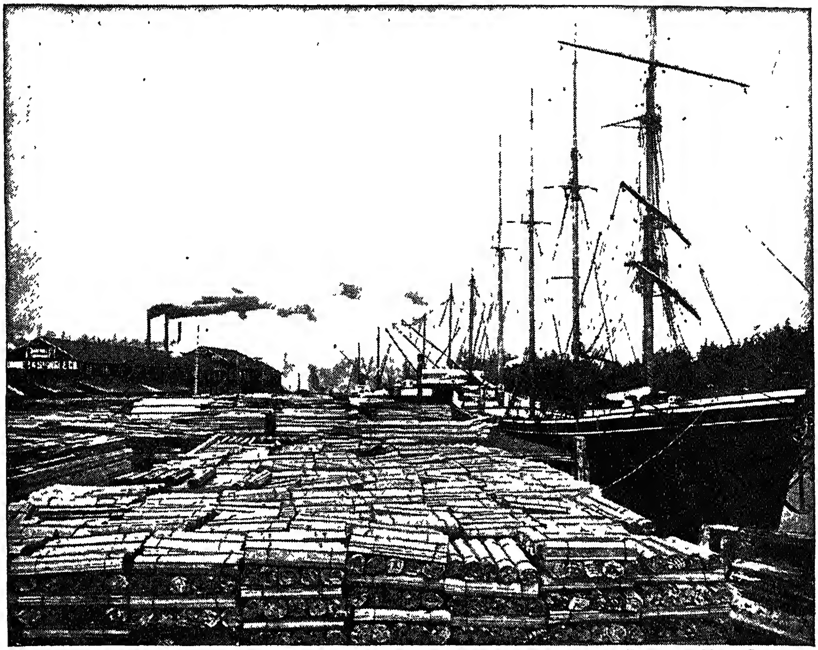
Shipments by sea to the Eastern Seaboard. The sale of Pacific Coast lumber in the Eastern Seaboard has developed notably since the opening of the Panama Canal. Formerly the shortest water route connecting our eastern and western coasts led round the tip of South America, a distance of more than 12,000 miles. The Panama Canal gives a route from Seattle to New York less than half the length of the older route. Now the larger Western companies have sales offices on the Atlantic Coast. Most of the lumber that they ship to Eastern United States by way of the Panama Canal is delivered on the water front at New York, Philadelphia, Boston, and Baltimore. Thence it goes by rail to wholesale and distributing centers in the northeastern section of the country.

Competition in Marketing Lumber. The forest regions of Northwestern and Southeastern United States compete with each other in our domestic markets. Both produce large quantities of lumber suitable for building purposes, and in many cases the buyer chooses one type or the other according to relative prices. As in all lines of trade dealing in bulky commodities, distance from market has much importance for competing producers.

Distance to market. When Pacific lumber is sold in markets of the Middle West and the Eastern Seaboard, it must compete with lumber from the Southeastern forests. The location of the two forest regions gives Southern companies an advantage of distance. Greater distance means higher freight rates, and freight costs affect prices. Since the Southern forests are much nearer to the Middle West and the Eastern Seaboard, one wonders how Western lumber can be sold at all in those markets. The answer lies partly in the nature of Pacific forests and partly in the special uses to which Western lumber is suited.

Large trees and yield per acre. When once the lumbermen learned to handle the big logs of the Pacific Northwest with machinery, they found the large size of the trees to be an advantage. Western sawmills can produce large-sized timbers in any number, and in Chicago, for instance, large dimensions of Douglas fir are cheaper than similar stock of Southern pine. The large size of the trees also reduces logging costs, and the yield per acre is enormous. In the yellow-pine belt of the South 5000 or 6000 board feet per acre is considered a fair yield; but the big trees of the Northwest give an average of 40,000 feet to the acre, and some tracts yield 150,000 feet. This condition reduces the cost of production and partly offsets the long haul.

Special-service products. Pacific forests yield wood particularly suited to certain special uses, and these woods find ready sale, even in distant markets. More than two thirds of the shingles used in the United States are cut from the red cedar of the Pacific Northwest. These cedar shingles do not warp, and they last well in spite of weather. Western red cedar is a favorite wood also for poles and posts because it does not decay readily when in contact with the earth. California redwood proves durable when it is used for building purposes or as railroad ties, and because it takes a beautiful satinlike finish it is widely used for interior finishing.



Keystone View Company

FIG. 106. Loading lumber at Hoquiam, Washington, for shipment to the Orient

Pacific Lumber in Foreign Lands. Outside the United States there is a demand for American lumber from two types of countries. When new areas are being settled, they need lumber for buildings, fences, bridges, docks, and railways. Brazil, Argentina, and Australia represent this type. They all import American lumber, since they do not produce enough for their own use. The second type of market is found in densely peopled countries where the forests long since were cut. Of this group Great Britain, Japan, and China are examples (Fig. 106). In British markets American lumber competes with that from Finland, Scandinavia, and the Soviet Union. In many cases American lumber is preferred because of its high quality, but in other cases buyers choose the European product because of more careful sawmill work.

How One Region Contributes to Another. What ordinarily happens when a large export order is placed in Seattle? This question may be answered by considering a large order received after Japan had suffered one of the most destructive earthquakes of recent years. Lumber in large quantities was urgently needed to rebuild the

Japanese cities. The order, like most of those received from foreign buyers, was placed with an exporter. As soon as it reached his office in Seattle the exporter chartered a vessel to carry the lumber. Next he communicated with lumber companies, giving the types of lumber desired. From their Seattle offices these companies sent out orders to their sawmills to have lumber cut into the required sizes. Part of the order was for paving blocks and telephone poles, and this necessitated dealing with one of the creosoting companies, which treat timber chemically to increase its durability. When the lumber was assembled at the pier, a representative of the Pacific Lumber Inspection Bureau examined it and made out a certificate showing that the quality was in accordance with the order. As soon as the cargo was aboard, the bills of lading were signed by the captain. Then a draft was made out and sent to one of the banks for collection. Before the vessel had time to reach the open Pacific the mill operators had received their payment.

Lumbering as a Permanent Industry. The future of the lumber trade of the Pacific Northwest depends upon how the cutover lands are managed. This forest area certainly should be devoted to producing a perpetual supply of lumber. Most of the forest land is too rugged for farms, and forests grow more rapidly than in most other parts of the country. Moreover, the principal commercial species scatter their own seed and will replant the cutover area if protected from fire. Fortunately, national forests have been established to include most of the mountain area, and private owners are co-operating with the Forest Service to protect the forests from fire. Some of the large companies working in Douglas fir and red cedar manage their holdings so that the forest area can be cut over repeatedly at stated intervals. If wise measures such as these are employed, the forests of the Pacific Northwest will be a perpetual source of wealth.

QUESTIONS

A. *The lumber industry*

1. What are the most important five uses of lumber?
2. What are the principal lumber-producing areas of the United States?
3. What are the leading three lumber-consuming areas of the United States?
4. What has happened in the forests of Eastern United States to increase the importance of the Pacific Northwest forests to the nation?

5. Why do the methods of lumbering in the Pacific Northwest differ from those employed in the Great Lakes states?

6. Are there more sawmill communities in the western part of Washington or in the eastern part (Fig. 104)? Explain.

7. Are most of the sawmill towns in the valleys or in the mountains? Explain.

8. Why are there many sawmill towns about the shores of Puget Sound? Are there more on the eastern shore of the sound or on the western shore? Explain.

9. Why are the logging methods of the East not suitable for the country shown in Fig. 98?

10. What is the destination of the log rafts sent out from the Columbia River? During which season of the year are such shipments made? Why?

11. What Southern states ship lumber (Fig. 105)?

12. Two carloads of lumber arrive in Chicago, one from Washington and one from Mississippi. On which are the freight charges the higher? Explain. Why, then, does Chicago buy any lumber from the Pacific Northwest?

B. *Climate and forest growth*

1. Young trees on cutover land do not grow at the same rate per year in Louisiana as in northern Minnesota.

In which area do they grow faster? What bearing have summer temperatures on this fact (Fig. 96)? winter temperatures? length of frost-free season (Fig. 72)?

2. Which grow faster, trees in the forests of the Pacific Northwest or those in Southern forests? Before answering, consider the following points:

In which forests are summer temperatures more favorable for growth? winter temperatures? In which does the length of the frost-free season suggest a greater amount of growth per year? In which is the summer rainfall more favorable for tree growth?

3. If trees grow in all months with average temperatures of 40 degrees or higher, how many months of each year will they grow in northern Minnesota? in the Pacific Northwest? in Louisiana?

EXERCISES

1. *Forests of the Pacific Northwest*

Write a description of the forests of the Pacific Northwest telling, among other things, (1) the distribution of the forests, (2) the principal species of timber, and (3) the appearance of the trees and the forest.

2. *Lumber traffic via Panama in a month*

Eastbound shipments of lumber through the Panama Canal amounted to 2,750,000 tons in the year ending June 30, 1937. In July of that year, 43 vessels carried 263,000 tons of lumber through the canal from the Pacific to the Atlantic.

a. Were the July shipments more or less than the average monthly shipments for the year?

b. About what was the average lumber cargo of these ships?

c. Of the 43 lumber cargoes, 27 were taken on at three Pacific ports (two in the United States and one in Canada). Which probably were the three ports?

d. One Pacific port furnished 15 of the cargoes. Which port probably did this?

e. Of the lumber cargoes taken on at ports of Washington and Oregon, 26 were landed at four Atlantic ports of the United States.

(1) Which four ports probably received these 26 cargoes?

(2) What was the nationality of the ships carrying these cargoes? How do you know?

f. Six vessels carrying lumber from British Columbia passed through the Panama Canal en route to Europe. These cargoes were all going to one country. What country probably was it?

g. More than half the lumber-carrying ships also carried "general cargo." What commodities probably were included in the list of general cargo?

AMERICAN HORTICULTURE

1. *Horticulture and Its World Distribution*

What Is Horticulture? Horticulture is a main division of agriculture and is concerned with fruits, vegetables, flowers, and ornamental plants. By patiently planting and replanting, by trying for better quality, and by watching for new varieties the farmers and gardeners of the past gradually developed fruits and vegetables with qualities superior to those of the wild varieties. When transportation became available, fruits and vegetables of one area were carried to other areas. For example, the apple and the orange, the most important orchard fruits of the United States, were not native to this country, and the so-called "Irish potato" was unknown in Europe until after it was discovered in America. Such experience shows the value of the interchange of ideas and products, the distinctive contribution of commerce.

Where Is Horticulture Practiced? Horticulture is almost as widespread as people. Some primitive societies gain their subsistence in part by hunting and fishing and in part from the cultivation of gardens. Many farmers also get part of their food from small gardens or orchards. Commercially, however, horticulture applies to areas where fruits and vegetables are cultivated intensively; that is, much labor and care are given to small plots of land. In such areas the garden or truck farm or orchard is the unit, rather than the farm or ranch.

So far as location is concerned, districts devoted to commercial horticulture are of two types. Those of the first type are located near big cities which furnish large markets for fruits, vegetables, and flowers. Horticultural districts are common, therefore, in densely peopled regions where there are many cities. Districts of the second type grow horticultural products at long distances from the market regions. They can do this profitably because their climates differ from those of the market regions or because their growing season comes at a different time of year. The banana districts of Central America and the apple districts of Tasmania (Australia) belong to this type. The principal market of the former is in the United States, whereas the latter ship mainly to Western Europe.

What Are the Commercial Horticultural Products? Have you ever eaten pomegranates or papayas? You would know the first if you had grown up in Turkey, and the second if you had lived in Brazil. Probably most regions have vegetables and fruits not grown or used elsewhere, but a few widely known fruits and vegetables constitute the horticultural products of commerce. Among these are the orchard and vineyard fruits—apples, pears, plums, cherries, apricots, peaches, and grapes; the strawberry, blackberry, and other small fruits; the citrus fruits—oranges, lemons, and grapefruit; the fig, date, raisin, prune, and other dried fruits; and such common vegetables as cabbages, tomatoes, potatoes, beets, lettuce, peas, corn, and beans. Many of the horticultural products enter into commerce in surprising volume and travel surprising distances.

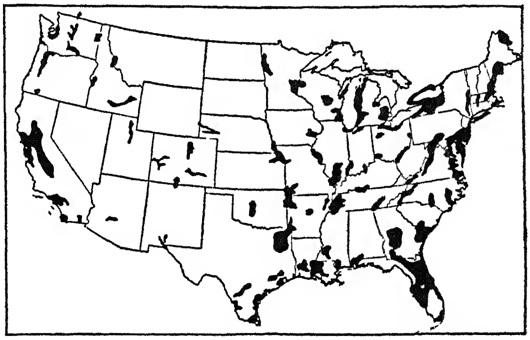


Fig. 107. Principal horticultural districts in the United States and Canada

2. *Supplying Our Cities with Fruits and Vegetables*

Supplying New York City. New York City generally has on hand about a forty-eight-hour supply of fresh fruits and vegetables. This supply is maintained by a steady inflow from many sections of the country (Fig. 107). Horticultural products are delivered to the produce markets during the night by railroads, trucks, and steamers. In the early hours of the morning agents of chain stores, jobbers, and other buyers visit the markets to purchase fruits and vegetables (Fig. 108). Later in the morning they sell to the thousands of grocery stores and shops scattered over New York City and its suburbs.

Principal Market Area. In much the same way other cities are supplied with horticultural products, though, of course, no other American city requires such large amounts as New York. In general the size of the fruit and vegetable business in a given area varies as

the number and size of the cities it contains. The northeastern quarter of the country contains thirty-five of our largest fifty cities and therefore is the great market area for fresh fruits and vegetables (Fig. 68). As a result, fruit and vegetable growers in all parts of the country bid for its favor.

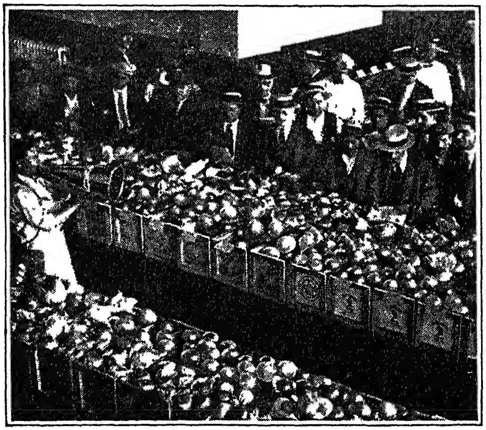


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Fig. 108. Early morning fruit auction in the Washington Market in New York City

Horticultural Districts. The combined value of all fruits and vegetables produced in the United States is exceeded only by that of such agricultural giants as wheat, corn, cotton, and hay and forage. However, there is no continuous horticultural belt comparable to the Cotton, Corn, and Wheat belts. Instead, flowers, fruits, and vegetables are grown for home use in nearly all parts of the country, and many small and widely scattered districts produce them on a commercial scale (Fig. 107).

Truck farms and market gardens. During summer and early autumn nearly every city obtains fruits and vegetables from truck farms and market gardens near at hand. The production of fruits and vegetables near a city represents a wise use of land, for it is expensive to ship such readily perishable products to a distant market. The advantage of bringing producer and consumer near together is recognized in Tokyo, Calcutta, and London, as well as in New York and Chicago.

Northern districts. The northeastern quarter of the country, with its numerous cities, contains many horticultural districts (Fig. 107). Three of these districts are of major importance. The first lies about the shores of Chesapeake and Delaware bays in Maryland, Delaware, and New Jersey (Fig. 109). It ships great quantities of berries, peaches, peas, tomatoes, and other fruits and vegetables to New York, Philadelphia, and other cities of the densely peopled seaboard area. The second district lies south of Lake Ontario (Figs. 109, 111, 112, and 114) and specializes in apples, grapes, and peaches. The third is

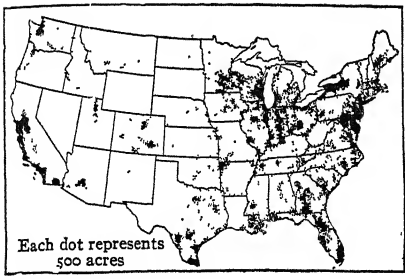

Fig. 109. Where vegetables are grown for sale. California and New York lead in production

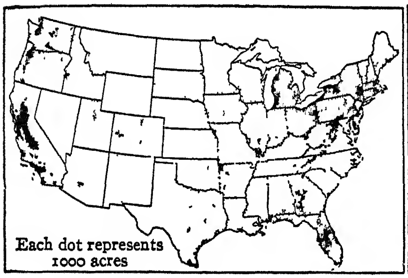

Fig. 110. Where fruit and nuts are grown. California has a fourth of the total acreage

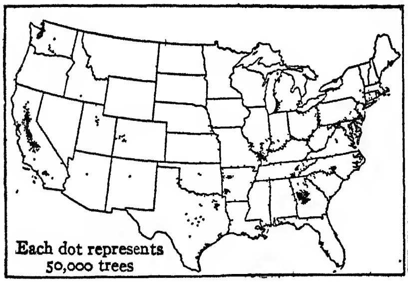

Fig. 111. Where peaches are grown. California and Georgia lead in peach production

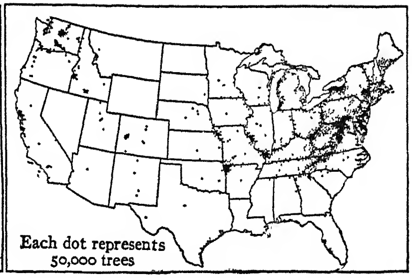

Fig. 112. Where apples are grown. Washington and New York lead in the production of apples

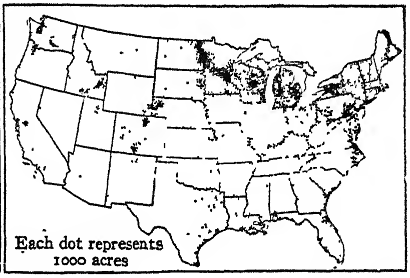

Fig. 113. Where potatoes are grown. Maine, Minnesota, and New York lead in production

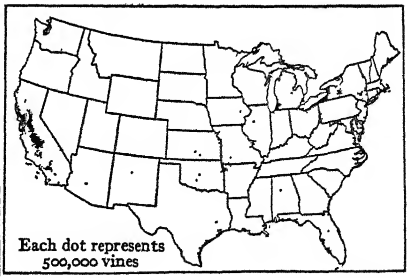

Fig. 114. Where grapes are grown. California produces three fourths of the total grape crop

Maps from U. S. Department of Agriculture

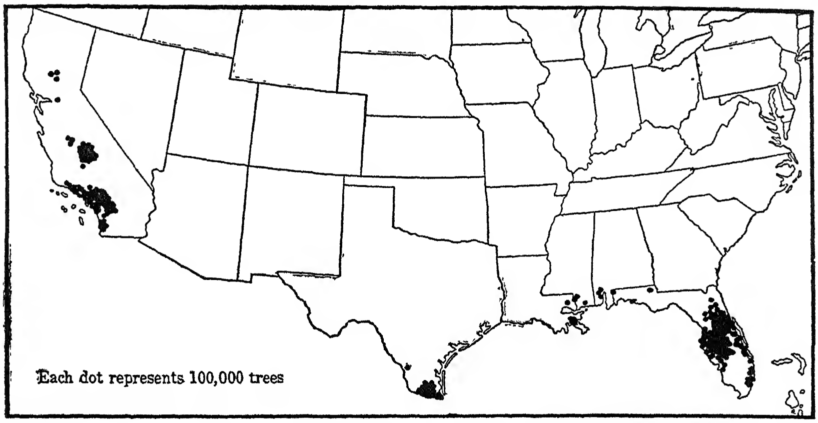

FIG. 115. Where citrus fruits are grown

the apple-peach-grape belt along the eastern shore of Lake Michigan (Figs. 110, 111, 112, and 114). Its greatest market is Chicago and the other cities about the southern end of Lake Michigan. In general the northern districts, like these three, lie close to large cities and produce vegetables and fruits common to middle latitudes. Much of their produce goes in fresh form to near-by markets, but canning factories prepare some of it for distribution to more distant markets.

Southern districts. Because their winters are short (Fig. 72) our Southern states have an important share in supplying our cities with fruits and vegetables. Shipments from the South are of two sorts. The first consists of oranges and other fruits which cannot be grown at all in the Northern states (Fig. 115), and the second includes early-season fruits and vegetables. Most of the oranges and grapefruit come from Florida, but Southern Texas has an expanding grapefruit industry. The earliest shipments of spring fruits and vegetables come from the central and southern parts of Florida and the Rio Grande delta of Texas. As spring advances northward, shipments of fresh fruits and vegetables are made from one district after another until the crop of the northern districts is ready.

Pacific Coast districts. Fully a third of the fruits and vegetables shipped by rail in this country originates in the horticultural districts of California, Oregon, and Washington. Much of the Western produce is grown under irrigation, because in that part of the country little rain falls in summer (Fig. 116). Consequently the horticultural

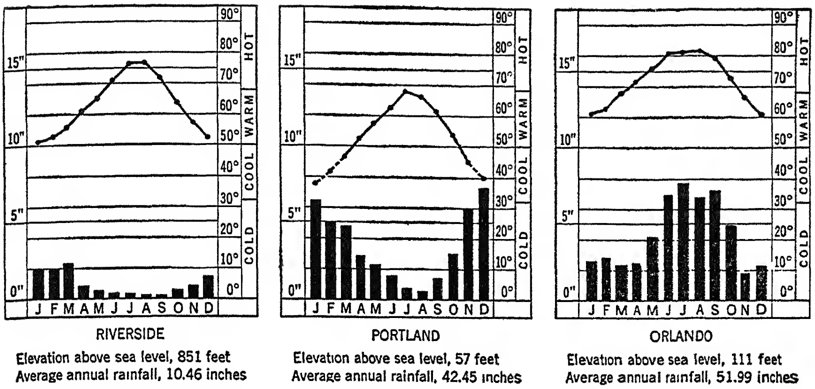

FIG. 116. Temperature and precipitation in three horticultural districts: Riverside, California; Portland, Oregon; and Orlando, in an orange-growing district of Florida

crops receive much sunshine and a carefully regulated supply of water. These conditions favor the production of many kinds of fruits and vegetables. California has the additional advantage of a short and mild winter, thereby permitting growers to take part in the early-season trade. Western produce is marketed in all parts of the country, and a surprisingly large part of it is hauled across the continent to the Eastern Seaboard. About half the perishable fruit shipped by rail from California is consumed in New York, Boston, and Philadelphia, and the cities within 75 miles of them.

Special products from California. California's place in the fruit and vegetable trade depends upon four types of products. The first type is made up of out-of-season strawberries, cantaloupes, tomatoes, and other fruits and vegetables. The second type includes canned peaches, asparagus, peas, and many other fruits and vegetables. Citrus fruits make up the third type, and the fourth type includes raisins, prunes, and other dried fruits. The dried fruits are a distinctive product of the dry summers and autumns prevailing in California.

3. *The Commercial Apple Crop*

Farm Orchards and Commerical Orchards. The apple is the most widely grown and most important of the tree fruits produced in North America. In the northeastern quarter of the United States nearly every farm has at least a few apple trees (Fig. 112), but many

of the trees bear only in the more favorable seasons. Even then the quantity is so small and the quality so poor that little or no attempt is made to sell the fruit. In contrast, the apple is an important cash crop where conditions are particularly favorable.

A Long-Term Crop. The apple is a long-term crop. Apple trees do not bear much fruit until they are ten or fifteen years old; but having reached bearing age, a well-managed orchard will yield fruit for many years. During the early unproductive years the growers must get an income from other crops. In some cases they plant crops between the rows of apple trees, but their income is derived more commonly from crops grown on other parts of the farm. In fact, in most apple-growing districts of Eastern United States the apple is only one of several farm crops.

Conditions Affecting Production. The apple crop varies in size from year to year. The irregular yield reflects in part the tendency of some varieties of apples to produce a big crop in one season and little or no fruit the following season. It also reflects weather conditions in the principal apple districts. When weather is favorable in all or most of the major districts, a bumper crop results; when it is unfavorable, a small crop follows.

Weather. Weather during the blossoming period has great importance for the success of the apple crop. When the days are clear, sunny, and mild, with little or no rain, the blossoms open fully and remain on the trees long enough for the fruit to set properly. In such weather also the bees and other insects are more active, carrying pollen from flower to flower. This interchange of pollen is essential to the setting of the fruit, and it takes place only in fair weather. A late frost sometimes causes great damage in our fruit districts, killing the blossoms or tiny buds. Even if there is no frost, a prolonged spell of cool weather will cause damage, for the blossoms do not germinate freely in temperatures lower than 40° F.

Although spring is the most critical period in apple culture, nevertheless the weather in other seasons may cause damage. Cool, rainy, windy days in June, for example, may cause the newly formed apples to drop in ruinous quantities. Hail may cause large damage to ripening fruit. Rainy weather during harvest delays picking, and early frosts may injure the crop. In some seasons the trees may be killed during the winter, although this is more likely to happen to the peach than to the apple.

Orchard sites. The site of an orchard is another condition which has a bearing on apple production. In general a site near a body of water is preferred. The apple districts bordering some sections of the Great Lakes, for example, have the advantage of a late spring. The water of the lakes remains cool long into the spring, and this coolness affects a narrow belt along the margins of the lakes. In most seasons it delays blossoming until danger from frost is past. In general an orchard on a hill slope does better than one on level land. This may be due to better soil drainage on the slope, for apple trees do not grow well in low, wet places. On a frosty night, too, damage from frost is less likely to occur on a hill slope where there is air drainage than on a valley bottom where the air remains quiet.

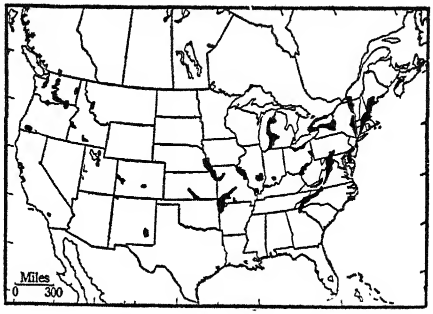

FIG. 117. Principal commercial apple districts of the United States and Canada

Orchard management. Experience shows that well-cared-for orchards produce more regularly and yield better fruit than those that are not skillfully managed. To this end the grower selects varieties suited to the soil and slope of his land and to local climatic conditions. He also plows and cultivates his land, fertilizes his soil, and prunes and sprays his trees in the way suited to the conditions under which he works. In fertilizing their orchards some farmers grow clover or some other cover crop and then plow it in. Such a practice adds nitrogen and humus, both important soil features. Other farmers use a commercial fertilizer, such as the nitrate of soda mined in Northern Chile. Spraying or dusting the trees is highly important in order to prevent injury by disease and insects. In many districts the time of spraying and the care with which it is done have much to do with the success or failure of the crop.

Principal Apple Districts. The commercial apple districts occur at irregular intervals from the Pacific Northwest to Maine (Fig. 117). This widespread distribution shows the apple to be a rather hardy fruit, adapted to a variety of climatic conditions. In two big sections of the country, however, apples are conspicuous by their absence. In

A A. A.

Fig. 118. Orchard landscape in Orleans County in the western part of New York State. The orchards can be recognized by the rows made by the trees. Lake Ontario appears in the upper right-hand corner

the South the climate, on the whole, is too warm and moist for apples, and the South finds greater interest and profit in other fruits. In the grassy plains of the Dakotas, Montana, and the Prairie Provinces of Canada, fruit trees cannot live in the severe winter weather.

Eastern apple districts of the United States. The commercial crop produced in our Atlantic states comes largely from three districts. The outstanding district is in New York State, particularly the area south of Lake Ontario (Fig. 118). This area is favored by its nearness to Lake Erie, by well-drained gravelly soils, and by its position between the cities of the Middle West and the Eastern Seaboard. A second apple district extends from Pennsylvania through Maryland, West Virginia, and Virginia to North Carolina. The third district lies in New England. The Eastern districts are well placed for selling to the cities along our Atlantic coast and for exporting apples to Europe.

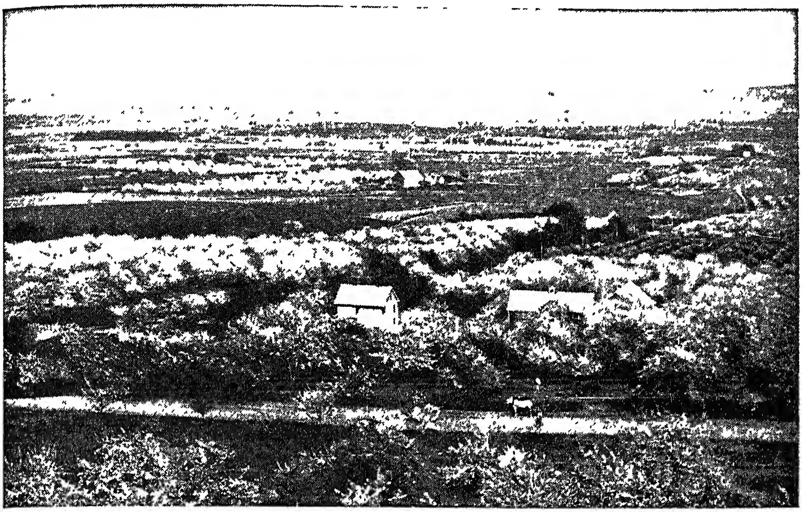

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FIG. 119. Apple orchards in the Cornwallis Valley, Nova Scotia. The orchard in the foreground is on the lower slope of North Mountain. The others are on the crests and slopes of low gravel hills on the floor of the valley. Such slopes afford both well-drained soils and air drainage on a frosty night

Apple districts of Eastern Canada. Eastern Canada has two important apple districts. The first lies north of Lake Erie in the province of Ontario and is a continuation of the apple area in the western part of New York. It supplies interior Canada, shipping as far west as Saskatchewan. The second district is the famous Annapolis-Cornwallis Valley of Nova Scotia (Fig. 119). It varies from three to ten miles in width and is about a hundred miles long. Apples have been grown in this valley since the time of "Evangeline," and today it is one of the most highly developed apple districts in America. The orchards produce with gratifying regularity, and about 70 per cent of the crop is shipped across the Atlantic to British markets.

Apple districts of the Middle West. In the Middle West the distinction between farm and commercial orchards is less clearly drawn than elsewhere in the continent. Nearly every farm has an orchard, and in favorable years fruit from some farm orchards finds its way to market. Orcharding is, however, a secondary matter except in a few special districts.

The apple districts of the Middle West lie near the margins of the Corn Belt, rather than within the fertile belt (Figs. 73 and 117).

The very qualities which make the land in these districts unsuited to cereals make it well suited to fruit. In the belt along the eastern margin of Lake Michigan, for example, the soil is too light and sandy for cereal crops, but is admirably adapted to fruit culture. The area is too far north and too near the lake to have the type of summer weather suited to corn production, but the influence of the lake favors apple culture. The apple districts in Missouri, Illinois, and the southern part of Ohio lie in hilly areas where much of the land is too rough for general farming and where the soil is more suited to fruit than to cereal crops.

Western apple districts. Recent decades have witnessed a remarkable development of apple culture in certain irrigated districts of Western United States and Canada. In fact, considerably more than a third of the commercial crop in this country now comes from the Western states. The Western districts lie far from the centers of population, but this disadvantage is offset by regular yields of high-grade fruit. One group of districts has developed in the Rocky Mountains, especially in Colorado and in Idaho. Another group is in California not far from San Francisco Bay, and the third and by far the most important lies in the Pacific Northwest. Washington alone produces about a fourth of our commercial crop.

Apple Culture in the Pacific Northwest. The Yakima and Wenatchee valleys in Washington are prominent among the apple districts of the Pacific Northwest and illustrate the highly favorable conditions under which apples are grown in that region. Year after year the orchards yield a large crop of high-grade fruit under a highly satisfactory combination of summer sunshine, fertile soil, and controlled water supply. The Yakima and Wenatchee valleys lie on the arid eastern flank of the Cascade Mountains, in an area otherwise devoted to livestock ranching (Fig. 100). The long, dry summers provide an abundance of sunshine for growing and ripening fruit, while water for irrigation is supplied from the rivers after which the districts are named. Both streams rise in the Cascades, and in spring and summer are nourished by the slowly melting mountain snow.

How Western Apples Compete with Eastern Apples. The principal market region for apples is the densely peopled belt extending east from Chicago to New York. Commonly the seaboard end of this belt is supplied by the Eastern districts, whereas the Western districts supply the western end. Although many growers specialize in a high-

grade pack, in general both the Eastern and Middle Western districts try to produce and sell apples at low cost. The bulk of their crop is sold for cooking purposes. The Far Western districts are so distant from the major markets that they cannot compete in the low-priced cooking trade. They do compete in the table-apple trade, for their apples have a beautiful color, and since each apple is wrapped in paper, their fruit reaches even distant markets in prime condition.

4. *The Citrus Fruits*

Why Our Citrus Fruits Come from Florida and California. A middle-latitude position gives most of the United States a cold, frosty winter, thus precluding the cultivation of oranges, lemons, and other tropical fruits. The southern border of the United States, however, enjoys mild winter weather, and of all the Southern localities, central and southern Florida and the coastal section of Southern California have the mildest winters (Fig. 116). In these two subtropical areas the cultivation of citrus fruits has grown into an important industry.

Why Central Florida Leads in Florida Production. Florida's experience with citrus-fruit culture demonstrates the importance of freedom from frost. Before the winter of 1894–1895 most of the orange groves were in the northern part of Florida. During that winter a severe frost killed most of the groves. For a time this experience discouraged orange culture. Gradually, however, the industry revived, but with the groves located in the central and southern parts of the state rather than in the northern part. The new locations (Fig. 115) not only are farther south but also lie between the Gulf of Mexico and the Atlantic Ocean. Ocean water changes its temperature but little from summer to winter, and thus winds off either the Gulf or the Atlantic are mild in temperature.

Importance of the Los Angeles District in California Production. In California the citrus fruits are even more definitely restricted to certain localities than in Florida; in fact, more than 80 per cent of the acreage devoted to citrus fruits in California lies in the Los Angeles District (Fig. 120). This district includes an irregular-shaped lowland flanked by mountain ranges at the north and east and by the sea at the west and southwest. Because it has a southerly position and because it is tempered by winds from the sea, the Los Angeles District has a mild winter. In general it is well suited to fruit culture, and

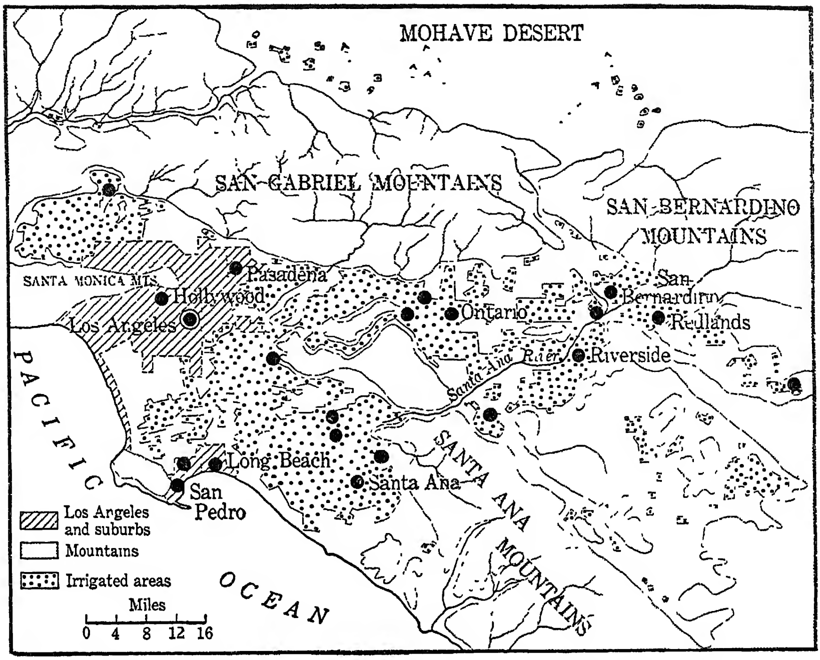


FIG. 120. The Los Angeles District of Southern California

fruits are produced in great variety and large quantity. Light frosts, however, do occur in an occasional year, and thus the citrus fruits are grown in those localities least subject to frosts. For the most part these sites are at the foot of the mountains, where the land, although level enough for cultivation, has sufficient slope to provide air drainage on a frosty night.

Principal Citrus Areas in the Los Angeles District. Two sections of the Los Angeles District stand out prominently in the production of citrus fruits. The first consists of an irregular belt about 80 miles long and from one to six miles wide lying in front of the San Gabriel–San Bernardino Mountains (Fig. 120). Most of it may be seen in a drive along the "Foot Hills Boulevard" between Los Angeles and Redlands. The second section lies west of the Santa Ana Mountains.

A Piedmont Alluvial Plain. The plain along which the boulevard runs east from Los Angeles is a fine example of a piedmont alluvial plain. *Pied* means "foot," and *mont* means "mountain," and thus a piedmont plain is one which lies at the foot of a mountain (Figs. 121 and 122). The term "alluvial" indicates that the materials of the

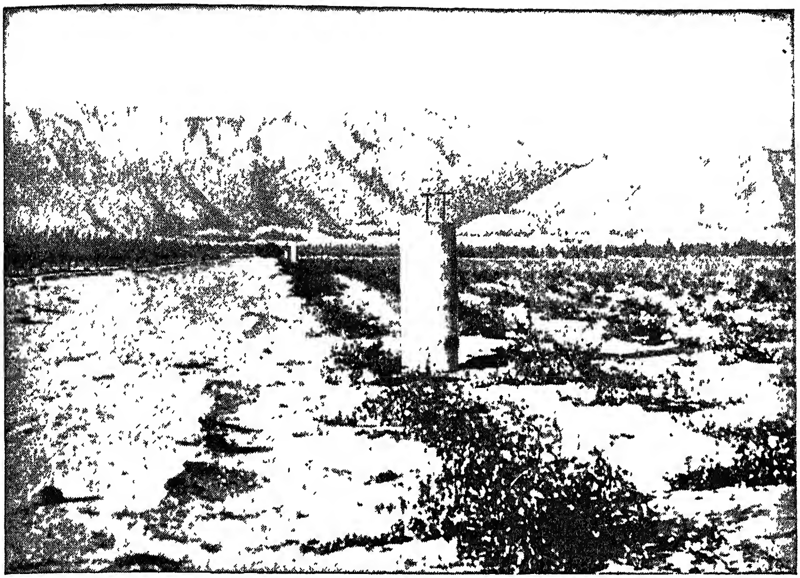


FIG. 121. Looking up the slope of the piedmont alluvial plain near Ontario, California. The crops in the foreground are grapes (right) and peaches (left). The dark line of trees in the distance marks the lower border of the citrus groves

plain were brought from the mountains by running water. When the streams are in flood, they carry sand, gravel, and stones from the mountains to the plains. This process has continued for long ages, and gradually the plain has been built up to its present form.

Landscape in the Citrus Belt. The citrus belt east of Los Angeles presents a distinctive landscape. As one drives eastward toward Redlands, for example, mountains rise abruptly at the left, while at the right the land slopes away gently for many miles. Masses of brush and shrubs mantle the foothills and lower slopes of the mountains, while late into the spring snows crown the higher summits. Most of the plain is under cultivation, and in general the crops are arranged in fairly definite bands (Fig. 121). Near the mountains the orange and lemon groves, with their deep-green color, mark the upper limit of cultivation. Farther down the slope the citrus groves give way to grapes, peaches, and other deciduous fruits. In this zone some of the land is planted to alfalfa, and dairying commands the interest of some of the farmers. Still farther down the slope barley is raised during the period of winter rains and is fed to livestock.

Why the Fruit Belt Lies Near the Mountains. The reason for the location of the citrus and other fruit crops on the piedmont alluvial

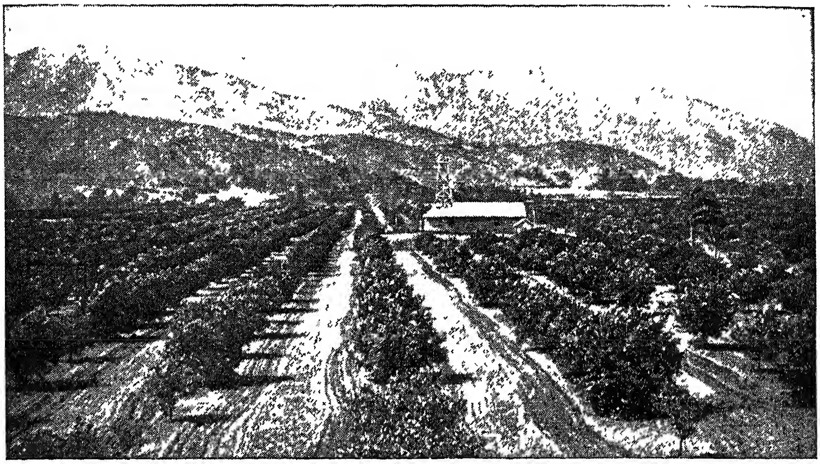


Fig. 122. An orange grove on the upper slope of the piedmont alluvial plain of the San Gabriel Mountains east of Los Angeles. The building is a pumping station

plains is found in the fact that the water used for irrigation comes from the mountains (Fig. 123). As a general rule the lowlands of Southern California are too dry for fruit crops without irrigation. The situation is aggravated by the fact that there, as all along the Pacific Coast, most of the rain comes in winter. Fortunately, however, the precipitation in the mountains is more than twice that of the lowlands and much of it comes in the form of snow. Winter rains and the melting of snow in spring swell the mountain streams. These streams carry water to the lowlands, where much of it is used for irrigation.

How Water Is Obtained. Some of the water used in irrigating the citrus groves is diverted from streams, and some is brought by long flumes from mountain reservoirs. In the citrus belt between Los Angeles and Redlands, however, much of the water is obtained from wells (Fig. 122). This practice grows out of the fact that the streams dwindle in size after they leave the mountains and most of the stream beds dry up in summer. Thus most of the streams disappear soon after leaving the mountains, except during the rainy winter season. Part of the water is lost by evaporation, but much of it sinks into the ground. The mixture of sand, mud, gravel, and

boulders which makes up the piedmont alluvial plain holds water like a sponge. Deep beneath the surface, therefore, great quantities of water are available. Frequently during the quiet of the night, one hears the monotonous chug, chug of the pumps as they lift the precious water to the surface. Because digging wells and installing pumps is too expensive for the ordinary grower, most of the wells are owned and operated by water companies.

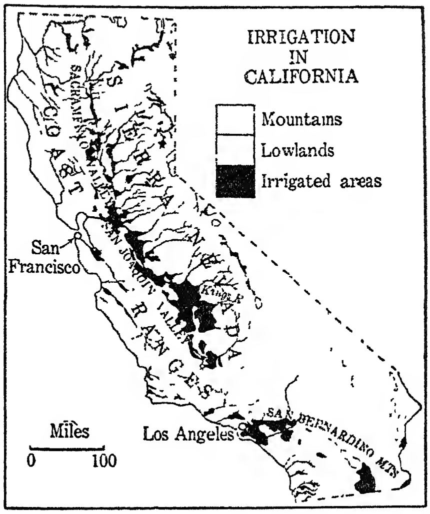


Fig. 123. Irrigated districts of California. Water is obtained from streams which rise in the mountains

Why the Citrus Groves Are Nearest the Mountains. The belted arrangement of crops on the piedmont alluvial plain in front of the San Gabriel and the San Bernardino mountains represents a wise use of land. Each crop is placed where it will do best. The orange and lemon groves are placed on the upper piedmont slopes because such a position greatly decreases the hazard of frost. On a clear, quiet, frosty night the air near the mountains becomes colder and heavier and moves slowly down the slope of the plain. Gradually it settles into the lower places far from the mountains. As the night wears on, the temperature of this quiet air falls, and frosts may occur. Such lowland places, therefore, are not planted to the citrus fruits. Near the mountains, however, the motion of the air as it drains down the slope is sufficient to keep the fruit from freezing. Farther down the slope, where light frosts are likely to occur once or twice during the winter, grapes, peaches, and other deciduous fruits are grown; for such fruits need the threat of frost to cause the vines and trees to rest in winter. In this piedmont section, therefore, one sees orange trees, which cannot stand frost, growing within a mile or two of grapevines, which need frost to attain their best development (Fig. 121). The upper slopes are frost-free, the middle slopes are not, and the belted arrangement of citrus and deciduous fruits places each type of fruit where it will do best.

How the Groves Are Protected from Frost. A decade or more may pass without frost in the citrus-growing areas of Florida and California, but damaging frosts occur occasionally. Many devices to prevent damage from occasional frosts have been tried. A common practice is to place oil heaters between the trees—in extreme cases a heater to each tree. In case the Weather Bureau predicts frost, the temperature is watched carefully during the night. If the thermometer falls to 32 degrees near the trees, the heaters are lighted, and in this way a further drop of temperature is prevented.

Competition in the Citrus-Fruit Trade. On the average each person in the United States and Canada consumes 58 oranges, 16 lemons, and 5 grapefruit a year. Thirty-six of the oranges come from California and 22 from Florida. As a result these two states compete for the orange trade. In the other fruits there is little competition; for California produces most of the lemons, and Florida most of the grapefruit. Even the competition in the orange trade is not so severe as might be expected, for the Florida and California crops do not ripen at the same time.

Why Oranges Are Available throughout the Year. Unlike most fresh fruits, oranges are on sale in our shops throughout the year. Four conditions explain this surprising fact. In the first place, the orange trees grow the year round, and may at one time display buds, blossoms, and both green and ripe fruit. In the second place, the bulk of the Florida shipments comes from October to February, while from California the greatest number are shipped from December to July. In the third place, California grows two important commercial varieties. These ripen at different times and thus lengthen the season. The navel orange is a winter variety and ripens from December to April, while the Valencia is a summer orange, ripening from May to November. Finally, the shipping season for oranges is lengthened because this fruit can hang on the trees without injury for some weeks after it is ripe. This is unlike the deciduous fruits, which must be picked as soon as they are ripe.

How California Oranges Are Marketed. As the principal market for California oranges and lemons is in the Middle West and the Eastern Seaboard, the bulk of the crop must be shipped from 1500 to 3000 miles. With reasonable care, however, the citrus fruits stand up well under transcontinental shipments. Freight charges on such long hauls are of necessity high, and, in addition, dealers must be

paid for handling and distributing the fruit. In many seasons the citrus growers have made money, but at other times the charges for transportation and handling have equaled or exceeded the price received for the fruit. At such times the growers suffer heavy losses. In order to minimize their marketing difficulties, many of the growers now co-operate in picking, packing, and shipping their fruit.

Local co-operative associations. In California there are about 15,000 citrus growers and approximately 250 local co-operative associations. Not all the growers belong to a co-operative association, but most of them do. Ordinarily a grower sells his fruit under a contract and does not pick it himself. Instead, the fruit is picked by crews of trained men under the direction of the association or of a packing company. This plan makes it possible to control the way in which the crop is picked, gives more regular employment to the picking crew, and regulates the amount of fruit sent to the packing house at any one time.

The central organization. Most of the local associations are affiliated with a central exchange. This exchange maintains headquarters in Los Angeles and consigns the fruit of its member associations to jobbers in our cities. Some fruit, however, is consigned by local associations and by independent packers who buy from growers not belonging to an association. The central association may have as many as 2000 cars en route at one time. By means of the telegraph the central office in Los Angeles controls the movement of its fruit cars in much the same way as does the marketing division of the banana companies. When the fruit reaches its destination, in many cases it is sold at public or private auction to jobbers or retailers. It is estimated that 3000 jobbers and 40,000 retailers sell oranges and lemons in the United States and Canada. Such a statement illustrates both the size of these two countries and the scope of modern industries.

QUESTIONS

A. *Horticulture in general*

1. What kinds of farming are included under horticulture?

2. How would a world map of horticulture compare with a world map of population?

3. What is meant by "commercial horticulture"?

4. On the basis of location in relation to markets, how may horticultural districts be divided?

5. At what hour would one find a produce market in a city at its busiest? Why then?

6. Why are there more horticultural districts in the northeastern quarter of the country than in the northwestern quarter?

7. In the Great Lakes area, which is more important for horticulture, the eastern or the western shores of the lakes? the northern or the southern shores?

8. Northern cities get strawberries from both Mississippi and Tennessee. Which crop is ready earlier?

9. Where, probably, are fresh vegetables from the western part of Michigan marketed? from the eastern part?

10. Why is the position of Baltimore favorable for the development of a large canning industry?

B. *Apple industry*

1. Make a statement about the distribution of commercial apple districts in Eastern United States; in the Middle West; in Western United States; in Canada.

2. What is the difference between a "farm orchard" and a "commercial orchard"?

3. Why are apples called a long-term crop? Name other long-term crops. Name some short-term crops.

4. Of what importance is weather in apple culture? State two ways in which the weather of the western district of New York differs from that of the Yakima district in Washington.

5. Why are many orchards planted on slopes? Name three districts in which this practice prevails.

6. Why is irrigation necessary in the Yakima and Wenatchee valleys? What is the source of the water used for irrigation?

7. Where is the largest market area for apples in the United States? Why there? How can Western apples compete with Eastern apples in Eastern cities?

C. *Southern California (Fig. 120)*

1. Why is the farmed land in Southern California on the south and west, rather than on the north and east, sides of the mountains?

2. Why are the streams on Figure 120 marked with continuous lines in the mountains and with broken lines in the lowlands?

3. What is the importance of the mountains to Southern California?

4. How do you explain the long, narrow, built-up area along the coast of Southern California?

5. Do you see any reason why Los Angeles chose San Pedro as the point at which to develop a port?

EXERCISES

1. *Horticultural districts*

Complete the table in this exercise so that it will show the characteristic fruit or vegetable crops of the following eight commercial horticultural districts: (1) central Florida, (2) southwest central Georgia, (3) Maryland east of Chesapeake Bay, (4) south shore of Lake Ontario, (5) east shore of Lake Michigan, (6) San Joaquin Valley of California (see also Figure 123), (7) Southern California, and (8) an additional district of your own selection. See Figures 107, 109, 110, and 111 to 115 inclusive.

Horticultural Districts	Horticultural Products
1. *Central Florida*	*citrus fruits, vegetables*

2. *Irrigation in California (Fig. 123)*

Copy the following statement, selecting the correct word from each pair of brackets.

Irrigation in California is largely in the [mountains lowlands], but the water for irrigation comes largely from the [mountains lowlands]. Most of the precipitation comes in the [winter spring summer autumn] months, and on the mountains it falls in the form of [rain snow]. The [Sacramento San Joaquin] Valley has the largest irrigated area. The water for the San Joaquin Valley comes from the [Coast Range Sierra Nevada San Bernardino Mountains].

CHAPTER XIV

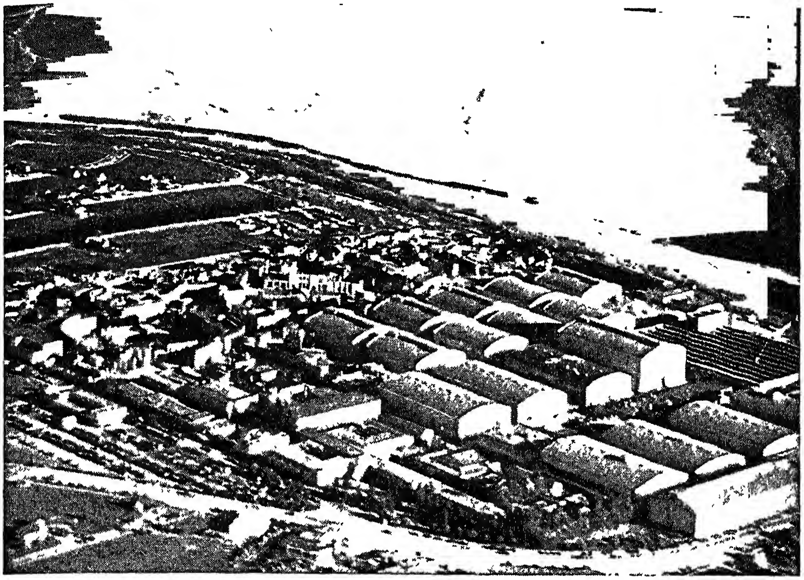
THE MOTION-PICTURE INDUSTRY

Centers of the Industry. While enjoyment of the "movies" is practically world-wide, the production of the films is distinctly localized. More than half the world's motion pictures are produced in the United States, and the American industry centers about two cities. Most of the pictures are produced in or near Los Angeles, the largest city on our Pacific Coast, but the administrative and commercial headquarters of the industry are in New York, the metropolis of our Eastern Seaboard. When these facts are recognized, three questions present themselves: (1) Why is the production of pictures concentrated in and about Los Angeles? (2) Why are the business headquarters and the center of the distributing system at New York? (3) Why does the United States lead in the world trade in motion pictures?

Dimensions of the Industry. Each week more than 85 million tickets are sold for admission to the 16,000 motion-picture theaters in this country. The preparation of photoplays to entertain these patrons requires a vast industry reaching all sections of the country and many foreign countries. Like other large industries, it includes in its organization three main divisions. *Production* is the manufacturing division and ends when the film is ready for the projection lantern. *Exhibition*, or the management of theaters where pictures are shown, corresponds to the retail trade of other industries. The connecting link between these two is *distribution*, the jobbing or wholesale division of the industry.

Los Angeles the Center of Production. Los Angeles occupies a unique position in the production of motion pictures. Nowhere else in the world is there a concentration of producers and production equal to that of Los Angeles and its suburbs. Practically all the large American producers have studios there, and the equipment for production represents the investment of many million dollars.

The studio communities. The studio communities represent, in reality, a new type of industrial suburb. These suburbs cluster about Los Angeles just as manufacturing towns are grouped on the outskirts of New York, Boston, or Chicago. Studios are located in the northern part of Los Angeles and both north and south of the Santa Monica Mountains, the most famous center being Hollywood (Fig. 120).



Ewing Galloway

FIG. 124. Studios in one of the northern suburbs of Los Angeles. While the industry still uses open sets, the coming of the talking film has made necessary a large number of permanent buildings with sound-proof walls

Factory characteristics of studios. Like other manufacturers, the motion-picture producer purchases or rents land in order to carry on his business. In some instances the area chosen lies along the base of the mountains and includes several types of scenery capable of serving as background for pictures. Most of the producing organizations have improved their holdings by building expensive plants which occupy a number of blocks, and which, with their high walls and great low buildings, resemble what they are in fact—highly specialized manufacturing establishments (Fig. 124).

The large amount of raw material which goes to the studio lots for consumption also suggests the factory nature of the motion-picture establishments. Vast quantities of lumber and other construction material are required; as the staging of scenes calls for many temporary structures, or "sets," in addition to the permanent buildings. The total length of film used annually runs into tens of thousands of miles, for ordinarily 100 prints of each picture are made for exhibition in this country and 60 for export. The laboratories require huge quantities of chemicals, as well as elaborate equipment

for developing, printing, and drying the films. The large companies maintain their own sawmills, furniture factories, and papier-mâché plants. They also employ a force of carpenters, electricians, interior decorators, cameramen, sound experts, and chemists. In fact, most of the people on the studio pay rolls are people whose faces never appear on the screen and whose voices never reach an auditorium.

What the Industry Means to Los Angeles. The production of motion pictures ranks next to petroleum among the industries of the Los Angeles District. Therefore it has a large share in the growth and prosperity of the city and affects nearly every industry in the area. It has increased the population of the district greatly, since the studios employ thousands of players and an even greater number of workmen. It attracts many tourists, thus increasing the demand for café and hotel accommodations. It stimulates trade with other parts of the country and with foreign countries. Lumber from the Pacific Northwest, Tropical America, and the Philippines is the leading freight item received at the port, and the motion-picture industry is the largest buyer of lumber in the district. The erection of studios gave business to the building trades, and the coming of talking pictures led to the expenditure of millions of dollars for soundproof buildings. The furnishing of studios stimulates the manufacture of motion-picture supplies, and the need for elaborate apparatus to record sound brought the great electrical manufacturing companies into the industry and the area. Similarly, the use of elaborate costumes and properties has led to a large development of the clothing and furniture industries.

Why Los Angeles Attracts Producers. The concentration of studios at Los Angeles is due to special advantages which the district offers for the production of pictures. These advantages were discovered by experiments in the early days of the industry. Production began in the East and at first was rather widely scattered. Producers went to various parts of the country in search of appropriate scenery to serve as background for their pictures. About 1903 someone chose Santa Monica as the location for a photoplay which included a marine scene. Immediately this picture attracted attention because of the superior quality of the photographic work. Later attempts showed similar excellent results, and within the next few years one company after another established permanent working quarters in Southern California. Now all important producers have studios in or near Los

Angeles, and all agree in acknowledging this to be the choicest of all locations in the country.

Quality of light. The excellent results obtained in outdoor photography form one of the major attractions which draw producers to Southern California. Even an unskilled tourist provided with a camera of indifferent quality succeeds in getting surprisingly good pictures. The sky is cloudless, the sunlight is intense, there is almost no wind, and outside the city the air generally is free from dust and smoke. Pictures, therefore, are remarkably clear in detail. The same desirable conditions prevail all over the southern half of the state, and producers can depend, ordinarily, upon obtaining good, clear outdoor pictures.

Great variety of scenery. Southern California offers a wide variety of scenery as background for motion pictures. This is a consideration of importance; for many plays are photographed "on location," that is, away from the studio lots. The beautiful residences, tall buildings, crowded streets, and factories of Los Angeles are near at hand for urban scenes. The sandy beaches and rocky headlands of the coast offer a perfect setting for marine scenes, and San Pedro displays the activities of a busy port. Orange groves and olive trees, with their suggestion of a Mediterranean landscape, furnish a suitable background for classical stories, and there are fields of barley, alfalfa, and other middle-latitude crops. Desert scenery is within easy reach (Fig. 120); and beyond the desert are the High Sierras, with all the characteristics necessary for depicting adventures in Alaska or the Alps. Railways and an excellent highway system make the varied scenery readily accessible, and Los Angeles, the railroad and highway center of Southern California, is the best point from which to reach the numerous locations.

Dependable weather. Little time is lost in Southern California on account of unfavorable weather. This is an important matter, because lost time is expensive in the picture industry. In Southern California there are occasional rainy days in winter; but grass and trees are green, flowers are blooming, and outdoor work goes on throughout the year with little or no interruption. Seldom, if ever, do players have an experience similar to the one met by an Eastern group some years ago. This group spent a week at a White Mountain hotel waiting in vain for a day clear enough to photograph a scene on Mt. Washington. Dependable weather favors the extensive con-

struction work involved in picture-making, for laborers can work out of doors in winter without discomfort. It also makes possible a saving of materials and expense. Elaborate sets frequently are constructed in the open, are built without roofs, and have only those walls which will appear in the picture. This, of course, would be impossible where frequent storms occur.

Steady inflow of labor. Location near Los Angeles is an advantage for the film industry in securing a satisfactory labor supply. The studio pay rolls include people of four classes—players, a technical staff of cameramen and laboratory workers, a large number of extras, and the force engaged in construction. The members of the third and fourth groups must be drawn from a near-by source. Only from a large city could the studios draw 30,000 extras for occasional and irregular services. The situation in Los Angeles is particularly favorable in this respect; for its mild climate attracts people from all parts of the country, and this influx of labor makes it possible to gather a large force on short notice.

Industry entrenched in Los Angeles. The motion-picture industry, established in the midst of favorable natural conditions, has built for itself, in effect, a California home. To the favorable natural conditions many features have been added which tend to hold the industry in the area. These include the expensive buildings upon the studio lots, the collections of valuable properties and costumes brought together to serve special needs, and the well-stocked zoos where animals for any sort of picture may be obtained on short notice.

The indexed files in the studio offices form a unique way of increasing the value of the area for the film-makers. Many locations have been visited, photographed, and described, and the results are on file in the offices of the "location men." When a director has decided on the list of settings desired for a new play, the location man can tell, by referring to his files, where to find each type of setting, be it mountain or desert, Spanish hacienda or miner's cabin. He can tell also which is the best route to the location and the price which the owner asks for the privilege of playing the scene on his property. In other files are photographs and descriptions of extras, enabling the director to find quickly the type of face and type of talent required for each part. Thus, many features of human origin have been added to the natural conditions which first attracted producers, and these tend to hold the industry in spite of the increasing trend toward in-

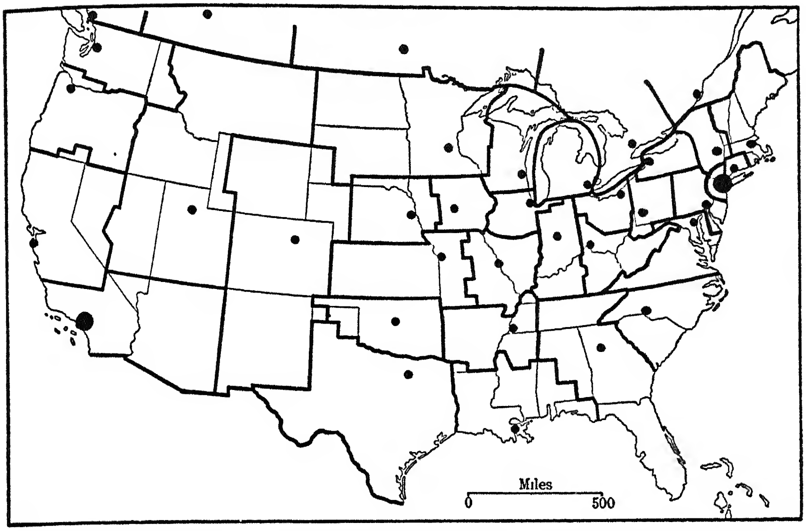


Fig. 125. Exchange centers for the distribution of motion-picture films

door pictures. By such means an industry fixes its roots in an area so firmly that it cannot be transplanted except with difficulty.

Distribution of Motion Pictures. Motion-picture prints are not sold to theater managers, but are leased to them for brief exhibition periods. From New York, the headquarters of distribution, the prints are distributed to more than 500 exchanges located in the 36 cities in the United States and Canada shown in Figure 125. The exchanges in turn rent the prints to theaters in their districts. Some of the larger companies also maintain exchanges in foreign countries. Commonly the motion-picture film in circulation at one time between exchanges and theaters amounts to more than 27,000 miles. It is important that the exchanges be located in cities with good railway services to many towns so that the films may be delivered promptly. Since the business of an exchange is somewhat like that of a wholesale house, most of the exchanges are in important wholesale centers.

Why New York Heads the Distributing System. For the commercial side of the motion-picture industry, New York has advantages which give it a leadership in distribution as distinct as the leadership of Los Angeles in production. New York's advantages are great enough to make up for the inconvenience of having the manufacturing and distributing centers 3000 miles apart. Four facts show

New York to be better adapted than any other city to stand at the head of the distributing system.

Superior communications. No other city can rival New York in the abundance of its mail and express service to the exchange cities of the United States, on the one hand, and to foreign countries, on the other. Rapid and regular communication is an important consideration in the distribution of motion pictures. Speed is so important that the industry makes large use of air-mail services, particularly in the delivery of news reels. A large number of railway, steamship, and air lines focus on New York. The railways run many fast trains daily, and the port of New York has more frequent steamship sailings than any other American port. It excels also in the number of foreign ports reached by its trade. Thus, so far as transportation and communication are concerned, New York is the best equipped city in the United States to serve both the domestic trade and the foreign trade.

New York the amusement center of the country. New York City is in itself the most important market in the country for the output of the Los Angeles studios. Its theaters are more numerous, the audiences are larger, and the prices of admission are higher than in other American cities. The New York exchange district (Fig. 125) not only has more theaters than any other district, but these theaters taken together contain more than twice as many seats as the theaters of any other district. New York is the amusement center of the country, and to a great extent it sets the fashion in amusement for other cities. A long run in New York is a valuable advertisement for a picture.

Central location in a densely peopled area. A third advantage of New York is its central location in the densely peopled Eastern Seaboard (Boston to Washington, D. C., inclusive), which contains many cities. Its central position is better than that of any other city for distributing to this seaboard area.

Our leading banking center. Producers borrow large sums of money to pay expenses while they are preparing elaborate feature pictures. In securing a big loan a producer must present evidence to the bank that he has made arrangements for the distribution and exhibition of the picture in question. This situation has encouraged producers to unite into a few large companies. It also has led some of the producing companies to build or purchase chains of theaters

and to maintain their own film exchanges. These companies, therefore, engage in each of the three divisions of the industry. The need for borrowing big sums makes it convenient for these companies to have their headquarters in New York, our greatest banking center.

Commerce in Motion-Picture Films. The motion-picture film has become firmly established as an article of commerce, both domestic and foreign. Pictures have gained their popularity because of the universal desire for entertainment. They satisfy a very real human need. The film is a commodity suitable for shipment over long distances. Its bulk is small in proportion to its value, and it is not readily perishable. A package small enough to go through the mails can carry an evening's entertainment for thousands, and the same film may be used again and again.

Export of American films. The export business of the motion-picture industry has reached considerable size, exporting both picture films and producing and exhibiting apparatus. American pictures now are exported to 70 countries, and foreign rentals bring to American producers from 15 per cent to 30 per cent of their total receipts. The introduction of sound greatly increased the export problem. People who cannot understand English naturally do not enjoy photoplays in the English language. Fortunately, the United Kingdom, Australia, Canada, and other English-speaking countries are among the big markets for motion-picture films. The other big language markets are Spanish, German, and French. To serve them, many of the feature pictures are filmed in those languages by special casts using the script and sets of the original production.

Sometimes American pictures exhibited abroad have an effect which the producers did not expect. The photoplay is an effectual salesman of American goods, even when there is no attempt at advertising. The screen makes known American styles, American household conveniences, or American machinery, and trade is turned into American channels as a result. An unexpected order for furniture illustrates this fact. The order came from an Argentine city and surprised the firm receiving it, for no furniture of that type had previously been sold or advertised in Argentina. Investigation showed that a picture exhibited there not long before had introduced the new style. Residents admired the furniture used in furnishing the set for an American domestic scene, and dealers had so many calls for it that they ordered stocks from the United States.

Import of films. Exposed motion-picture film appears in growing quantities among our imports. Feature pictures received from abroad include photoplays by foreign producers and stories of foreign writers filmed by American producers on the locations actually described. Great Britain, France, and Germany are the principal sources of foreign photoplays, but commercial production is under way in at least twelve other countries. Our theaters provide an important market for imported films, since they are at liberty to show pictures from any country, and American audiences include many people interested in becoming acquainted with foreign customs and foreign plays. In addition to photoplays, we import news reels and pictures recording the experiences of travelers and explorers.

Historical Value of Films. Although most motion-picture films are designed purely for amusement or to depict matters of temporary interest, some of them record important ideas or events in a way that makes them valuable sources of historical knowledge. They show the dress and customs of the present, and in many cases show exactly how some event occurred. In order to preserve these records for future generations, the Federal government is collecting films of historical value and storing them in the National Archives Building at Washington.

American Leadership in Motion-Picture Production. There is a definite relationship between the leadership of American films and the great size and resources of our country. The theatergoing public in the United States is so large that American showings alone can give producers a profit on a picture costing thousands of dollars. American patronage is capable of supporting the industry in almost its present volume; for the United States has a large population, and a large proportion of its people are able to pay something for their amusement. The enormous returns from American showings make it possible for American producers to excel in the quantity and variety of their output, and they expend vast sums in the production of their special-feature films. These characteristics have much to do with the popularity of American films, and they are definitely related to the great resources upon which American prosperity is based.

QUESTIONS

1. What is the significance of New York in the motion-picture industry? of Los Angeles? of Hollywood? of the exchange cities?

2. In what ways has the growth of the motion-picture industry increased the business of Los Angeles?

3. Of what significance to the motion-picture industry are (1) quality of light, (2) scenic features, (3) transportation facilities, (4) weather, (5) labor, and (6) knowledge of region?

4. Why should the districts served by the exchange cities vary in size?

5. Why are films shipped by air to some cities, whereas most cities are served by rail or truck deliveries?

6. How might the exhibition of American motion pictures abroad increase our foreign trade?

EXERCISES

1. *Relation of motion-picture industry to natural environment*

Outline a talk explaining how the natural environment of Southern California attracts the motion-picture industry.

2. *The exchange city nearest you (Fig. 125)*

Write a composition about the exchange city from which films are sent to your town. Tell why you think it was chosen instead of some other city. (Study its railway connections with New York and with towns in the surrounding territory. Think of its size and its rank as a shopping center. Does it ever have big conventions?) Give an account of some personal experience in the city, such as (1) going to see some famous picture having its "first run," or (2) attendance on a big event which attracted many people from other towns.

CHAPTER XV

THE NORTH AMERICAN WHEAT CROP AND ITS WORLD SIGNIFICANCE

1. *Wheat Trade and Wheat Regions*

World Trade in Wheat. Every day in the year ships carrying wheat travel along ocean lanes, their combined cargoes amounting to many millions of bushels. Other agencies also are concerned in the movement of wheat. Thousands of freight cars move into and out of the rural towns of the exporting regions, loading wheat and carrying it to flour mills or to the ports where grain ships get their cargoes. Huge elevators with cleverly planned loading machinery tower above railway sidings. In the principal commercial centers great business organizations buy and sell wheat and direct its shipment from exporting to importing regions. The wheat trade is one of the world's commercial giants, never asleep either winter or summer.

One great importing region. The world's wheat trade may be pictured as a procession of ships traveling from widely separated regions to Western Europe (Fig. 126); in fact, the wheat trade exists largely to serve that region. In spite of its large wheat acreage, and in spite of the fact that its skillful farmers grow nearly a third of the world's wheat, Western Europe is the great wheat market of the world. Having a large population long accustomed to wheat bread, it consumes the wheat from its own farms and imports from other regions.

Market areas in the United States. Like Western Europe, our Atlantic and Gulf states consume more wheat than they produce; but they buy from other parts of the United States, and the wheat movement belongs to our domestic trade. These states have large populations, and most of their cultivated land is used for crops other than wheat. In addition, manufacturers in Eastern United States grind some Canadian wheat into flour for export.

Three great exporting areas. Though wheat is grown in all the continents and in many types of climate, only three great areas have a large surplus for export (Fig. 126). Eurasia contains three large wheat-producing areas (Europe, Eastern Asia, and India), but no one of these ranks as a great exporter. Europe is both the largest producer and the largest consumer. In Eastern Asia consumption

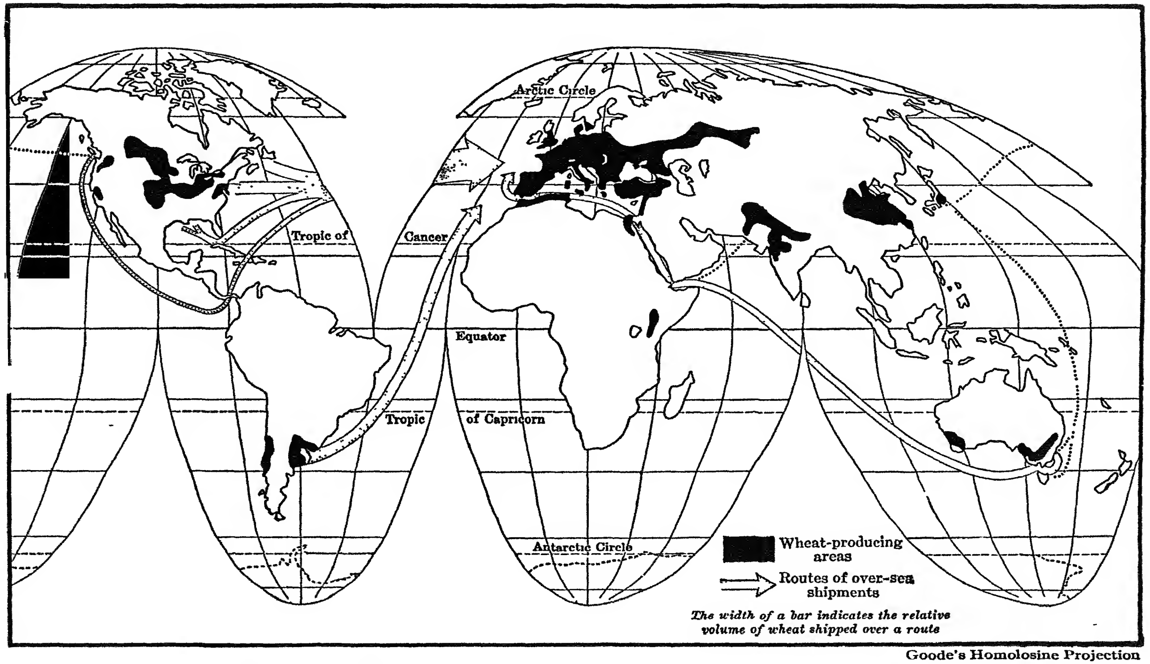


FIG. 126. Wheat-producing areas and the oversea trade in wheat

about equals production, and India has imported more wheat in recent years than it has exported. Interior North America, Argentina, and Australia produce most of the world's export wheat. Interior North America, including the major wheat areas of the United States and Canada, ranks first as an exporting region, the export coming mainly from Canadian wheat fields. The United States produces more than twice as much wheat as Canada, but contains about twelve times as many people. More than half the Canadian crop goes to foreign markets; but we consume most of our crop. Argentina ranks second to Canada as an exporting country, but its shipments are much less.

Characteristics of exporting areas. Interior North America, Argentina, and Australia are alike in having natural conditions especially suitable for wheat culture, and they are alike also in being newly settled areas with populations of only moderate density (Fig. 1). This combination of favorable growing conditions and relatively small consumption accounts for their importance in the export trade.

Conditions affecting wheat production include latitude, elevation, climate, and soil. The three exporting regions lie in middle latitudes, where the year includes a cool or cold season and a frost-free season of moderate length. They have sunny summers and a moderate rainfall (from 15 to 35 inches annually). Wheat thrives best when it has a cool, moist season for its early growth and dry, sunny weather for the ripening period. The three exporting areas are lowlands with much land level enough for the use of farm machinery, and this condition helps in producing a large crop cheaply. They all have fine grassland soils which are particularly suited to the growth of the grasslike wheat crop. Having been farmed for relatively short periods, the soil still retains some of its virgin fertility and thus yields fair crops with less labor and less fertilizer than are needed in older farming regions.

Seasons in the Wheat Trade. Wheat-exporting countries compete for the trade of Western Europe just as rival grocers compete for the trade of a community. Fortunately the world's wheat crops do not all ripen at the same time, and this makes the competition somewhat less keen. From August to December the imports into Western Europe consist mainly of North American wheat, from January to March wheat moves northward from Argentina and Australia, and from May to August wheat is shipped from India. This arrange-

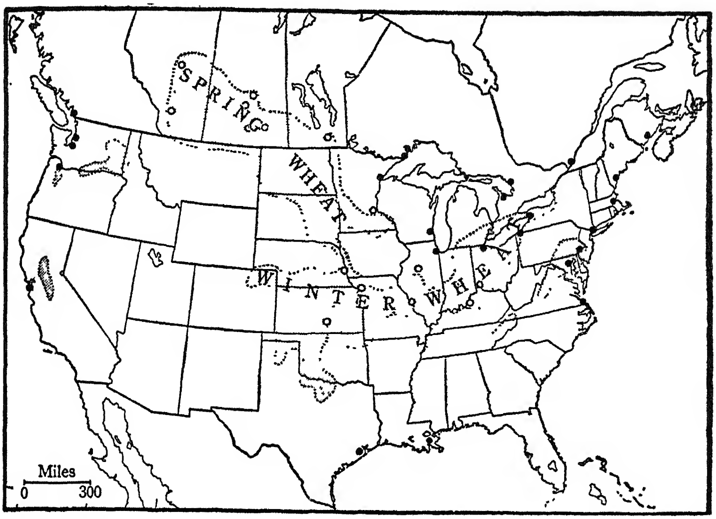


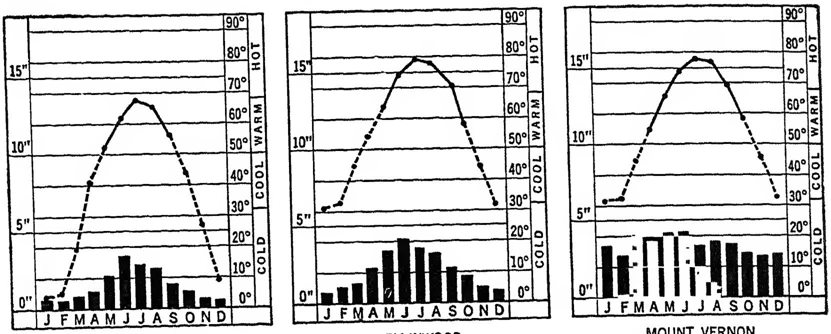
FIG. 127. Principal wheat-producing areas in United States and Canada. Open circles are primary markets and solid dots are grain ports

ment of seasons gives the importing countries a year-round supply without storing vast quantities for long periods. It also gives the wheat ships a long season of business, enabling them to visit one region after another.

2. *Growing and Marketing North American Wheat*

Wheat Regions and Varieties. Many parts of North America grow wheat, but the greater part of the crop comes from the interior of the continent. The crop includes many varieties; but most of them belong to three types—hard winter wheat, soft winter wheat, and spring wheat—all these types being wanted in the manufacture of flour. The three types of wheat flourish under somewhat different conditions, and Interior North America includes two wheat belts. In the more northerly belt, spring wheat is grown; and in the more southerly, winter wheat (Fig. 127). The Columbia Plateau produces both types.

Winter wheat areas. The irregular belt extending from northern Texas and eastern Colorado to Pennsylvania and Ontario produces winter wheat, which, under favorable conditions, gives a larger yield than spring wheat. The grain is sown about September. During the



DEVILS LAKE
Elevation above sea level, 1,478 feet
Average annual rainfall, 17.56 inches

ELLINWOOD
Elevation above sea level, 1,537 feet
Average annual rainfall, 25.51 inches

MOUNT VERNON
Elevation above sea level, 463 feet
Average annual rainfall, 40.83 inches

Fig. 128. Temperature and precipitation in three wheat regions: Devils Lake, North Dakota, in the Spring Wheat Region; Ellinwood, Kansas, in the Hard Winter Wheat Region; and Mount Vernon, Illinois, in the Corn and Winter Wheat Belt

cool weather of autumn the wheat sprouts, and before winter sets in it covers the ground with a grasslike mat of green. Although the winters are relatively mild, they are too cold for plant growth, and the wheat lies dormant until spring. Then it finishes its growth and ripens in early summer.

The western part of the belt produces hard wheat and thus gets its name—Hard Winter Wheat Region (Fig. 73). There the crop grows under semiarid conditions, the annual rainfall being not much more than half the amount received in the wheat areas east of the Mississippi. About three fourths of the rain falls in the months from April to September, inclusive (Fig. 128); but, even so, crops suffer for want of rain in some years. However, the hot and sunny weather of early summer has a favorable effect on the quality of hard wheat, and drought-resistant varieties have been found that give a fair crop in most years.

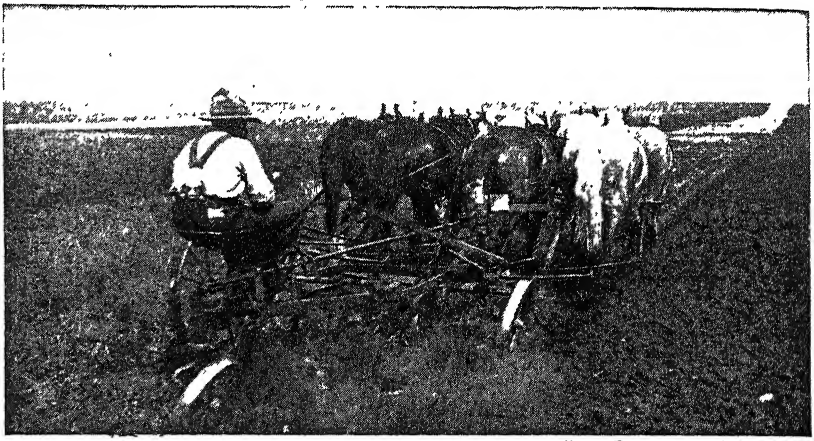
In the Corn and Winter Wheat Belt (Fig. 73) soft wheat is grown. In this humid area (Figs. 70 and 128) rain is plentiful enough and regular enough for growing corn and clover, and the farms produce fodder for livestock in addition to wheat. Therefore both wheat and livestock are sources of farm income.

The Spring Wheat Region. The Spring Wheat Region produces about half the North American wheat crop and accounts for an even greater share of the export volume. It extends from Minnesota and

North Dakota to the northern limits of agriculture in the Prairie Provinces of Canada (Fig. 127). The region has long cold winters (Fig. 72) with less snow than areas farther east, and strong winds often keep the fields cleared of snow. Without a snow cover, winter wheat will not survive such weather and thus it is a doubtful crop for this region. Seeding generally takes place a little after the middle of April in North Dakota, later in areas farther north, and earlier in South Dakota. The frost-free season is shorter than in the winter-wheat areas and the summer weather is cooler, but the summer days are longer. The long hours of daylight speed up the growth of the plants, and the wheat needs less time to mature than in more southerly areas. Harvest occurs in late summer or early autumn.

Federal and state agencies have experimented for many years with drought-resistant crops found in other parts of the world. Certain grain sorghums, particularly kafir corn and milo maize, are grown successfully for feed in the Hard Winter Wheat Region; but these are not cash crops, and they do not flourish in the more northerly Spring Wheat Region. Some farmers in the Spring Wheat Region grow flax, and in recent years many of them have planted sweet clover for feed. But the flax crop fails in many years, and sweet clover is not altogether satisfactory as a pasture and hay crop. It is hoped that in time a successful combination of crops and livestock may be found for these semiarid areas.

Agricultural Science in the Canadian Prairies. In North America wheat culture has pushed farther and farther north, illustrating the progress of mankind in learning to utilize new environments. Early settlers found that in some seasons wheat would not mature in the short growing season of Saskatchewan and Alberta. The problem was solved when a Canadian scientist developed Marquis wheat, an earlier-maturing variety. Season by season he sorted out plants that ripened early, planting their seed the following year. Gradually he developed a variety which reduced the period between seeding and harvesting from 120 days to 110. In most seasons farmers growing this new variety are able to harvest their crop before frost injures it. Experiments have continued, however, and a new variety, Garnet wheat, has been announced. This variety, it is claimed, matures in ten days less than Marquis. Thus, through the co-operation of farmers and scientists, the boundary of the Canadian wheat-growing area is being extended to the north. In such ways mankind "conquers the earth."



Alberta Department of Agriculture

FIG. 129. A gang plow turning the fertile soil of the Alberta prairie

The Role of Machinery in Wheat Culture. Wheat culture in the vast interior plains of the United States and Canada illustrates the importance of farm machinery. It is farm machinery, combined with the vast stretches of rich, level land, that enables the North American farmers to grow wheat cheaply enough to sell at a profit in distant Europe. Without machinery, a grain farm of ten acres requires the work of at least two or three men. By using machinery, many a farmer in the United States and Canada cultivates two or three hundred acres, with additional help only during the busier seasons.

Preparing the land and sowing the crop. Machinery is important both in preparing the land and in sowing the seed. In the Canadian portion of the Spring Wheat Region it is important to speed up these tasks, because the season is barely long enough for the crop. Ordinarily, seeding cannot begin before the middle of April, and the whole crop must be in by the middle of May in order that it may mature before frost comes. The farmer prefers to plow in the fall, so that he can begin seeding in the spring as soon as weather permits; but he cannot plow frozen ground, and cold weather is likely to interrupt his work. Hence he speeds up the work by using a gang plow, which opens two or three furrows at once and which is drawn either by horses or by a tractor (Fig. 129). The harrow and other machines for breaking up the clods complete the preparation of the field, and by using a horse-drawn seeder, or drill, one man can sow many acres of the level farm land in a day.

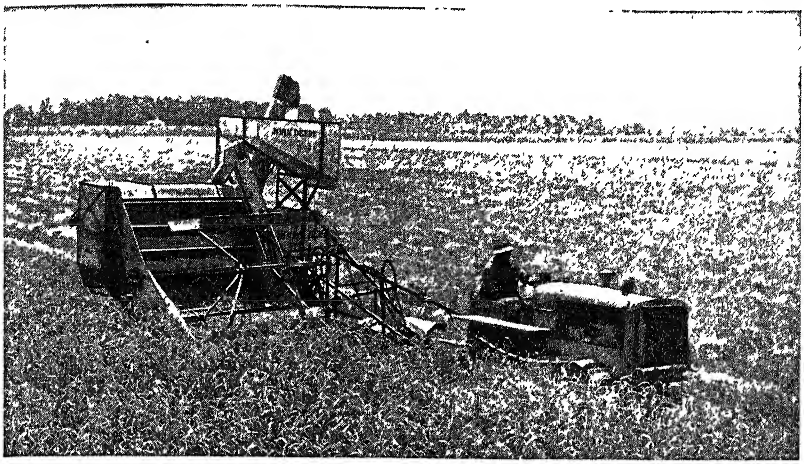
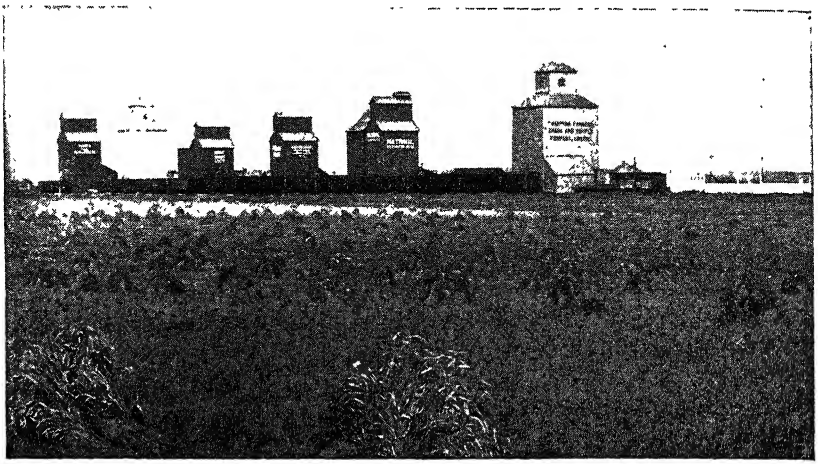


FIG. 130. Harvesting wheat with a combine in Indiana. The machine cuts and threshes the grain in one operation, thus economizing in both time and labor

Harvest. Harvest ushers in the rush season. Within the brief interval of a few days vast acreages of wheat ripen, and the farmer races with weather; for if wind, rain, or hail should come, much of the grain would be lost. The self-binder cuts and binds the grain from an eight-foot swath and dumps the bundles in piles. Men follow the machine and pile the bundles into shocks. After a few days of clear weather the grain becomes dry enough to thresh. A threshing machine separates the grain from the straw and chaff, but in recent years a machine called a "combine" has come into wide use. This machine is drawn by a tractor or several horses, and it cuts and threshes the grain in one operation (Fig. 130). By its use harvesting and threshing become a matter of days instead of weeks. It greatly reduces the number of men required for harvest; it does not use twine, as the old binders did; and it enables the farmer to put his grain on the market earlier than under the former plan.

Equipment for Moving Wheat. The wheat-growing sections of North America are well equipped for transporting wheat and other cereals to market. Most farms lie less than ten miles from a railway station, and practically every station has one or more grain elevators (Fig. 131). In the three Prairie Provinces of Canada, for example, there are more than 4000 elevators, each playing its part in handling the wheat crop and each forming a conspicuous feature in the level,



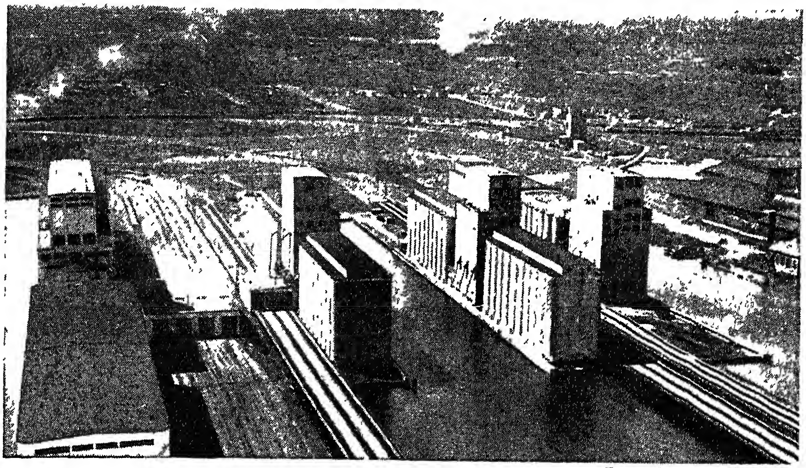
Alberta Department of Agriculture

FIG. 131. Grain elevators at Champion, Alberta. These elevators receive grain from the farms in the surrounding area. The white fences are loading pens for livestock

open landscape. At the elevators and, in fact, all along the way from producer to consumer, wheat is handled by machinery. In this way railway cars and ships are loaded and unloaded rapidly, cheaply, and with a great saving of human labor.

Delivering Wheat to the Local Market. During the threshing season and for a time thereafter, business is active in the elevator towns. Much of the wheat comes direct from the combines without storage on the farms. The farmers haul the grain in wagons with boxes holding about 50 bushels or in trucks that take much bigger loads. Load after load of grain arrives throughout the day, and a line of teams and wagons moves across the elevator dump, stopping only long enough to let the grain pour out of the wagon box. At the country elevator the grain is weighed, cleaned, stored, and, when ready for shipment, loaded into freight cars by machinery.

Primary Markets. From the villages and towns where the farmers sell their grain, the wheat is shipped by rail to centrally located cities known as primary markets (Fig. 127). The market centers handle great quantities of grain, and in them the grain is inspected and graded. Such inspecting and grading is necessary because (1) different kinds of wheat are grown in different sections of the wheat belts, (2) quality is affected by weather and farming methods, (3) different grades and kinds of wheat are needed for different purposes,



Royal Canadian Air Force

FIG. 132. Grain elevators at Port Arthur, Ontario

and (4) wheat is bought and sold by kind and grade. After the grain has been inspected and graded, it is ready to be sold, and it then goes either to milling companies in the United States or Canada, or else into the export trade.

Importance of the Great Lakes in the Wheat Trade. Much grain from the primary markets of the Middle West moves by way of the Great Lakes to Eastern United States and Eastern Canada for consumption or export. The Great Lakes have such a broad span at the west that Lake Superior reaches out toward the Spring Wheat Region, while Lake Michigan extends toward the winter-wheat area (Fig. 127). Grain-handling ports have grown up at the heads of the lakes—Fort William, Port Arthur (Fig. 132), and Duluth on Lake Superior and Chicago on Lake Michigan being particularly important. These ports attract large quantities of grain because they have excellent railway connections with the wheat areas and because lake rates usually are a little cheaper than rail rates.

At the east the Great Lakes extend toward the Atlantic along three routes (Plate I). Georgian Bay, the eastern arm of Lake Huron, points toward Montreal, the great port at the head of navigation on the St. Lawrence, and thus establishes the northern route. Lake Ontario and the St. Lawrence carry shipments over the middle route. This is an all-water route to Montreal; but cargoes must be

transferred from the lake vessels to river steamers, because there are five sets of rapids between Lake Ontario and Montreal. Canals have been built around the rapids, but they are too small to handle the big grain-carrying boats from the upper lakes. At the south Lake Erie brings the lake traffic within reach of the great ports of the United States, and on its shores the grain traffic divides into several branches. Many vessels deliver grain to Buffalo and other Lake Erie ports, and from them it is carried by rail to the seaboard. From Buffalo some grain moves on the New York Barge Canal and the Hudson River to New York.

American Flour-Milling Centers. Mills at many points along the wheat routes to the seaboard grind wheat into flour. In both the United States and Canada small mills doing a local business are scattered through the wheat-growing areas; but the principal flour-milling centers are either primary markets or else wheat ports. Thus Kansas City, St. Louis, Minneapolis, and Winnipeg are important milling centers as well as great primary markets; there are big flour mills at the principal lake ports; and Montreal, St. John, Portland, Boston, New York, Philadelphia, and Baltimore are flour-milling centers as well as grain-exporting ports.

Ports Engaged in Exporting Wheat. North American export wheat moves through ports on the Atlantic, the Gulf, and the Pacific, and minor quantities of Canadian grain are shipped by way of Hudson Bay. Galveston, Houston, and New Orleans draw mainly from the Hard Winter Wheat Region. Wheat from the Columbia Plateau moves through Portland, Tacoma, and Seattle, while Vancouver is the chief Pacific outlet for wheat from the Canadian Prairies. The bulk of North American export wheat is shipped through Atlantic ports, with New York and Montreal in the lead. Before 1915 practically no American wheat was shipped to Europe via Pacific ports. Even after the opening of the Panama Canal the Canadian wheat trade could not make large use of the route until new elevators had been built and provisions made for inspecting and grading wheat in the West. Shipment through Pacific ports has been increasing since the early 1920's, and Vancouver now ships about a third of Canada's export wheat. The shortest route from the Canadian Prairies to Liverpool leads through Hudson Bay, but this route is open for only a short time each summer.

How wheat moves overseas. Much grain is shipped to Europe from the North American and other wheat-growing regions in tramp

ships chartered for the purpose. In autumn and early winter, when our exports of wheat reach their climax, many tramps come to our ports because shipowners know that cargoes will be waiting for their ships. When a tramp ship ties up at a terminal elevator, long spouts are lowered into its hatches, and the vessel is loaded in a few hours. Special care is taken in loading bulk wheat, for in a storm the loose grain may shift and cause the ship to list. In many instances a layer of wheat in bags is placed above the bulk wheat in order to keep the cargo in place.

Many ships that ply on a definite schedule carry wheat as part cargo. Such vessels are called cargo liners or, if they also carry passengers, cargo-passenger liners. In many instances exporters find it a great convenience to be able to engage space on a ship that is scheduled to sail at a stated time. This idea applies more particularly to perishable or highly valuable goods, but at times it also applies to grain.

Receiving Wheat in Europe. Wheat enters Western Europe through many ports (Plate V). Great Britain is the largest consumer of imported wheat; and Liverpool, looking westward toward the Americas, is the leading wheat port. Rotterdam, at the mouth of the Rhine, receives large quantities for the interior of the Continent, notably for Germany and Switzerland. London, Le Havre, Antwerp, Hull, and Hamburg are other important grain-receiving ports.

Flour-Milling in Western Europe. Flour-milling in Western Europe is not done on a large-scale basis to the same extent as in the United States and Canada. In Great Britain, for example, consumers cling to the familiar brand which they long have purchased from the local miller, and almost every British city has its flour mills. Milling on a larger scale characterizes the receiving ports, and the leading four wheat-importing ports of Great Britain (Liverpool, London, Hull, and Cardiff) are also the principal milling centers. Thus the distribution of mills is related both to consuming areas and to routes of trade.

QUESTIONS

A. *About wheat and the world's wheat trade*

1. Does Europe grow much wheat?

2. The Italian wheat crop is much larger than the Australian. How does it happen that Italy imports and Australia exports wheat?

3. How does it happen that the Argentine wheat crop ripens at a different time from the wheat of North America?

4. Does Figure 42 represent a climate favorable for growing wheat? How do you know?

5. What major wheat-exporting country probably ships parts of its crop by way of the Suez Canal?

6. Of the three major wheat-exporting regions, which has the shortest sea haul to Western Europe? Which has the longest?

7. Which exports more wheat, the United States or Canada? Why?

8. China grows three times as much wheat as Canada. Is it a major exporting country? Why (Fig. 1)?

9. Has the Panama Canal any importance for wheat-growers in our Pacific Northwest? Why?

B. *The wheat crops and wheat trade of the United States and Canada*

1. Which type of wheat is grown in each of the following areas: Kansas, North Dakota, Illinois?

2. Which area has the coldest winters (Fig. 128)?

3. Which has the hottest summers?

4. Assuming that the ground is frozen during all months which have average temperatures of 32 degrees or lower, in which of the wheat regions does the ground remain frozen longest in winter?

5. Do growers of winter wheat prefer to have the wheat fields covered with snow or bare during severe winter weather?

6. In which of the wheat areas is there more likely to be snow on the ground during the season of frozen soil?

7. In the middle of June the sun rises at about 5:15 A.M. (Standard time) in Oklahoma and sets about 8 P.M., but at Prince Albert, near the northern margin of the Spring Wheat Region, it rises about 3:40 A.M. and sets about 8:20 P.M. About how much difference is there in the length of June days at the two places? What difference does this make to the wheat crop?

8. What wheat region sends much wheat by rail to Lake Superior ports for shipment by water? Which ports handle most of the business?

9. Which wheat areas ship grain through Pacific ports? Why is this traffic heavier than it was before 1914?

10. Since the Hudson Bay route to Britain is shorter than any other route leading from the interior of Canada, why does it not carry most of the wheat export?

11. Why is much wheat ground into flour in Winnipeg, Kansas City, Minneapolis, Montreal, and Buffalo?

EXERCISES

1. *An outline of Chapter XV*

Prepare an outline of this chapter according to the following directions:

a. Write the chapter title at the head of your outline.

b. Let your outline have headings of three ranks only.

c. Number your major headings (headings of first rank) I and II, using Roman numerals. Notice that the chapter has two headings of first rank, and that these headings are numbered and are printed in large italics.

d. Indent the headings of second rank, setting them over so that they begin about a half inch farther to the right than the major headings. Use the letters *A* and *B* instead of numbers for these headings. Notice that there are two headings of second rank under "Wheat Trade and Wheat Regions" and that these are printed in boldface type.

e. Indent the headings of third rank, beginning them a half inch farther to the right than the headings of second rank. Use Arabic numerals (1, 2, etc.) for headings of third rank. Notice that there are four headings of third rank under "World Trade in Wheat," and that these headings are printed in italics.

The beginning of your outline should look like this:

THE NORTH AMERICAN WHEAT CROP AND ITS WORLD SIGNIFICANCE

I. Wheat trade and wheat regions

A. World trade in wheat

1. One great importing region
2.
3.

2. *Rainfall of two North American wheat regions*

Study Figure 128 and then write a paragraph comparing the rainfall in the Spring Wheat Region (Devils Lake, North Dakota) with that of the Corn and Winter Wheat Belt (Mount Vernon, Illinois). Consider the following points: (1) difference in total rainfall for year, (2) approximate amount of precipitation in months with average temperature of 50° F. or above, (3) importance of this difference for growing a variety of crops, (4) approximate amount of precipitation in months with average temperatures below 40° F., (5) whether winter precipitation has any importance for wheat culture.

CHAPTER XVI

MEAT-PACKING AND THE CORN BELT

1. *Livestock Markets and the Packing Industry*

Our Meat Supply. Our meat markets or the meat departments of our stores are the immediate sources of our meat supply. Back of them, however, lies a series of well-organized industries which employ many people and utilize a large proportion of the land area of the country. The series includes farms and ranches where the stock are reared and fattened; great stock markets where they are assembled, graded, and sold; packing plants where the animals are slaughtered and the meat and other products prepared; and, finally, the meat-selling agencies which deliver to the retail establishments.

Livestock Markets and the Packing Industry. If our population and our livestock were distributed evenly, a country-wide system of local packing plants might serve our needs. In reality approximately two thirds of the people of the United States live east of the Mississippi River, while nearly two thirds of the livestock are raised west of it. As a result, some sections of the country produce a surplus of livestock, while others consume far more than they produce. Out of this inequality of supply and demand comes the need for livestock markets and our packing industry. By means of livestock markets and packing plants, farmers and ranchers are assured of a market for their stock, and people in all parts of the country gain a regular supply of meat for their tables.

Distribution of Livestock Markets. Public livestock markets are distributed fairly widely in the country, but fourteen markets handle about two thirds of the total business (Fig. 133). Each of the fourteen is a railway center of major importance and thus has a wide tributary area from which to assemble livestock. Eleven of the fourteen are located in or near the Corn Belt. This distribution is logical, for six Corn Belt states—Nebraska, Iowa, Missouri, Illinois, Indiana, and Ohio—commonly ship about 45 per cent of the swine and about 50 per cent of the cattle received by the packing houses in this country.

Principal Packing Centers. In the principal livestock markets packing plants are located near the stockyards. As a general rule the more important the livestock market, the more important the packing plants. Six of the packing cities—Chicago, Kansas City, Omaha,

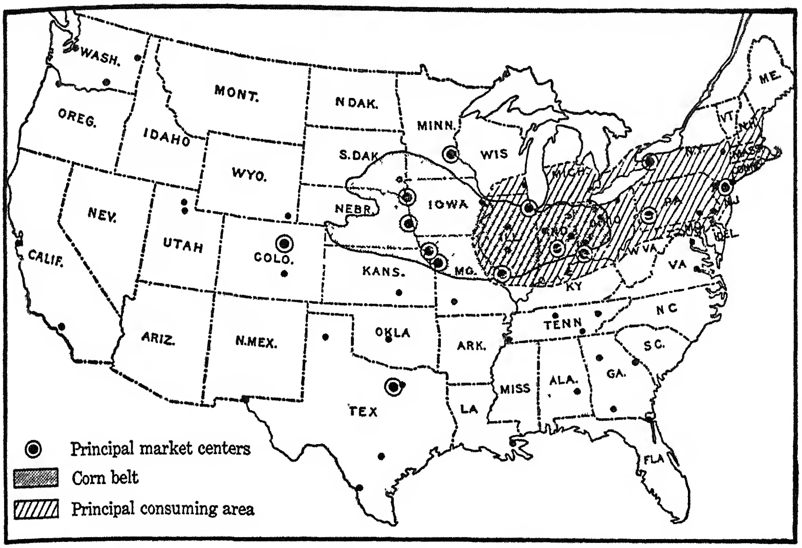


FIG. 133. Public livestock markets in the United States. The major consuming area coincides with the densely peopled manufacturing belt (Figs. 67 and 78)

New York, Indianapolis, and St. Louis—produce approximately 50 per cent of the total value of packing-house products in this country. Chicago alone produces about a fourth of the total. With the exception of Metropolitan New York, all the leading packing centers are in the Middle West.

Why Chicago Is the Principal Center. Chicago has long been known as the leading livestock market and the greatest meat-packing center in the world. No other industry, in fact, is associated as uniformly with our Middle Western metropolis as is the packing industry. To a marked degree the conditions which have led to the development of the packing industry in Chicago are those which encouraged the growth of other lines of industry in the city. Some of these conditions are present also in the other packing centers.

Central position and railway connections. The central position of Chicago between the livestock areas of the West and the consuming areas of the East underlies its leadership as a livestock market and packing center. The central position is emphasized by the numerous railways which enter the city (Fig. 94). Lines from the west, northwest, and southwest bring in livestock from a huge farming and grazing area, and meat and meat products are shipped eastward over

the numerous trunk lines extending from Chicago to the Atlantic Coast. Shipments over these lines are so large that freight trains made up in Chicago run on regular fast schedule between Chicago and most of the Eastern cities. Such fast through service is of great advantage in delivering a perishable product to a distant market.

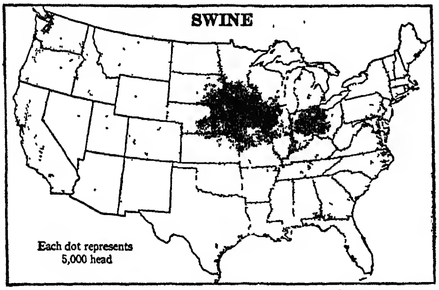


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FIG. 134. Swine in the United States

Large local market. The packing industry, like many other industries, finds in Metropolitan Chicago a large local market for its products. Chicago, together with its numerous and growing suburbs, is by far the largest consuming market in the Middle West, and therefore the Chicago packing industry has a larger local business than any other Middle Western packing center. This same force has encouraged the development in Chicago of lumber, furniture, iron-and-steel, and petroleum-refining industries.

Established leadership. Early success in solving the problems of the industry accounts in part for Chicago's high rank in the packing industry. Chicago packers played an important part in solving the problem of the long haul from the Middle West to the Eastern Seaboard. In the early days of the industry live animals were shipped by rail from Chicago to Eastern markets. Such shipments soon developed into an important business, and the railroads built special cars to move the stock. The practice was far from satisfactory; for railroad services at that time were so slow and crude that the animals lost on the way from 10 to 15 per cent in weight. About 1870 one of the Chicago packers tried shipping fresh meat to New York in an ice-cooled car. The experiment proved successful, and in time the use of refrigeration revolutionized the industry. Under the new plan the stock was slaughtered in the Middle Western packing plants, and the fresh meat was shipped under refrigeration to Eastern markets. As the railroads did not build the expensive refrigerator cars, the packers built them and to this day still own their refrigerator cars.

Present evidences of leadership are found in the fact that the large meat-packing companies have their headquarters in Chicago. From Chicago they direct activities in Argentina and Europe, as well as

n the United States. Most orders for foreign delivery either ed from the Chicago plants or are assembled in Chicago from r centers. As the prod-re assembled they are d in carload lots to sea-points for export. Out se and other evidences idership Chicago has a reputation in the g industry which, in is a valuable asset.

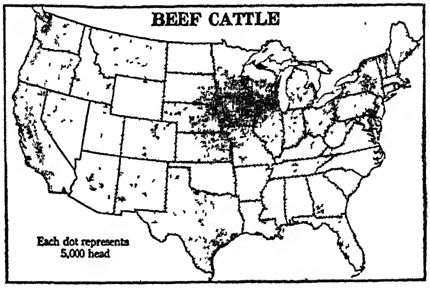

FIG. 135. Beef cattle in the United States

gin of the Livestock. igh nearly all parts of iited States produce livestock, more hogs and more cattle are d to market from the Corn Belt than from any other section of intry (Figs. 134 and 135). Most farmers keep enough hogs for wn tables; but in the Corn Belt hog-raising is a major interest, iis region produces fully 60 per cent of the hogs sold in the l States. Many hogs also come from the dairy districts of Min-, Wisconsin, and New York, where skimmed milk and whey, ducts of the dairy industry, form part of their feed.

:f cattle are not raised as generally by Corn Belt farmers as are out, nevertheless, the total number is large. Two regions—the Plains and the Corn Belt—together produce about half the beef of the country, and many cattle bred on the Great Plains are :d for market in the Corn Belt.

ist of the sheep shipped to market in this country are raised in ountain valleys, plains, and plateaus of the West (Fig. 136), , California, and Idaho being the leading states. Sheep do well sture which would not support cattle, and they range even on int grass of desert pastures. As a rule the sheep are fattened on . in the irrigated areas or else they are shipped to the Corn Belt :attened.

utine of the Industry. The functions performed by the livestock :ts and packing centers involve many facilities and services. All iportant centers are equipped with stockyards, a belt-line rail-:ommission houses, packing plants, banks, market newspapers, :legraphic and radio facilities. Chicago, being the largest center, :n by way of illustration.

Delivering the livestock. Farmers in the area tributary to Chicago deliver their stock to loading pens at their railway stations. Local freight trains haul the stock cars to points where the cars are assembled into special stock trains. These trains run into Chicago on express-train schedule. On arrival the cars are routed via the Chicago Junction Railway to the unloading chutes. This short but highly important railway connects the stockyards with the major railroads entering the city and operates all trains into and out of the yards (Fig. 137).

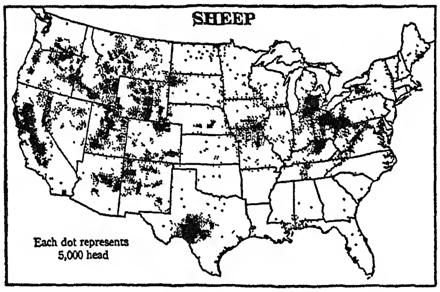

FIG. 136. Sheep in the United States

Selling the stock. After the stock are unloaded into the pens they are fed and watered. Then they are offered for sale, in most cases by commission firms to whom the farmers consign their stock. The buyers may be local butchers, representatives of local or national packers, or traders and speculators who buy and sell whenever they sense a chance of profit. A bargain is completed with a word or nod, and the transactions are so arranged that the farmer gets his money immediately after his stock is sold.

The packing plants. The packing house is a factory which receives the animals as raw materials and turns out such finished products as meat, lard, and hides and skins. Government inspectors certify as to the fitness of each carcass for food. In addition to the output of meat, the packing plants turn out large quantities of by-products, in many cases made from those parts of the animal which were formerly wasted. Thus, bones are made into combs and buttons, hair is used for felt and in upholstering furniture, and other parts are made into soap, oleomargarine, and many other things. The industry is so highly competitive that no packing house could ignore its by-products and continue long in business. The utilization of some by-products, however, requires equipment so expensive that only large plants can afford to install it. This is one reason why most of the business is carried on in big plants and in only a few places. Some of the uses for waste products have been discovered by workmen in the plants; others, by scientists.

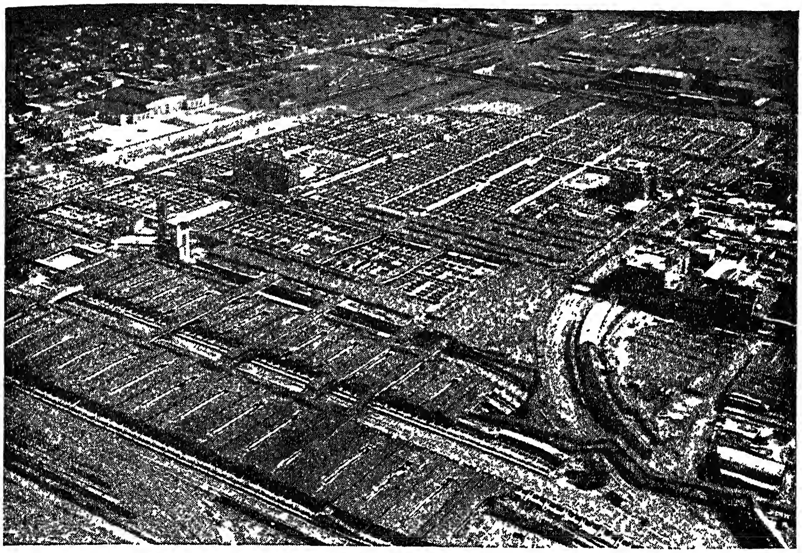

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FIG. 137. "Packingtown," Chicago. In the foreground are the overhead runways through which the animals are driven from the railroads to the pens. The covered pens show in the foreground, whereas the open pens are in the middle distance. The packing plants are at the right

Marketing Meat. A highly important function of the packing industry is to distribute its products to the retail shops. Packing houses with a nation-wide business employ two methods in selling their output. The larger part is sold through branch houses, to which the meat is shipped under refrigeration in carload lots. Branch houses are located in cities large enough to develop a considerable volume of business, one of the larger companies maintaining more than 400 such houses. The second method of serving the trade is by means of car routes. Under this system a salesman from a packing center or a branch house solicits orders in the towns along a railroad leading out from his city. These orders are filled from a refrigerator car dispatched over the route once or twice a week. The car-route system aids greatly in placing fresh meat of good quality in the smaller communities.

Exports of Animal Products. Although our exports have decreased, the United States plays an important role in the international trade in animal products. Our export trade rests largely upon shipments of pork and lard to Western Europe. Many of the liners clear-

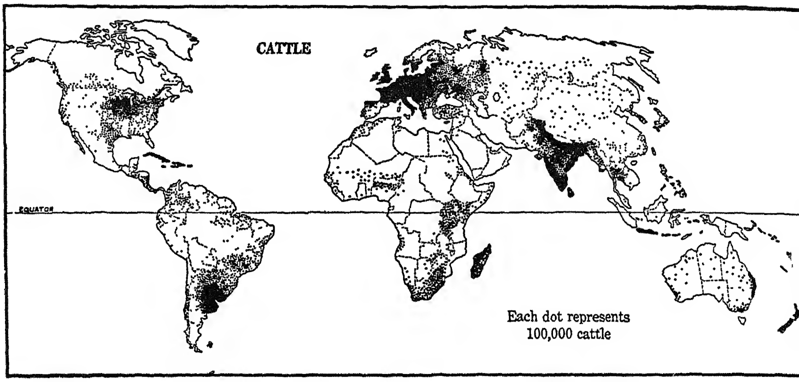

FIG. 138. Cattle-producing areas of the world

ing the port of New York for Liverpool, Hamburg, Antwerp, or other ports of Western Europe carry lard and fresh or cured pork. Fresh pork travels only on ships provided with refrigerator space. Hams, bacon, and lard, however, remain in good condition if they are placed in the cooler parts of the hold. In our export trade in meat and meat products Great Britain is our principal customer. Smaller amounts, however, go to France, the Netherlands, Belgium, and Germany.

Imports of Animal Products. Hides and skins are the leading animal products in our import trade. For many years the United States has led in the tanning industry, and hides and skins from nearly all parts of the world are brought to this country to be tanned into leather. We also import wool for our factories from China, Australia, Argentina, and many other countries. Another feature of our trade in animal products is our small but increasing import of canned beef from Argentina and Uruguay (Fig. 138).

2. *The Corn Belt*

What Is the Corn Belt? The Corn Belt is a region in which a certain system of agriculture prevails. The keynote of this system is the raising of corn to fatten hogs and beef cattle (Figs. 73, 134, 135, and 139). The livestock sold off the farm represent the principal cash return to the farmer. In addition to corn, the farmers raise oats and a hay crop as feed for cattle and horses (Figs. 140 and 148). Some

poultry is kept on almost all Corn Belt farms, and in some sections sheep are raised. In some parts of the belt wheat is raised as a cash crop, and at times when the price is attractive any of the crops may be sold off the farm.

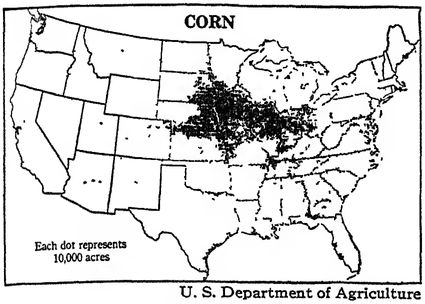

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Fig. 139. Where corn is raised

The area over which the Corn Belt system prevails extends from Ohio to South Dakota and Nebraska, as shown in Figure 73. It is the largest continuous body of fertile, well-drained level land in the United States, and it has the hot, humid summers essential to the best growth of corn (Figs. 69, 72, 141 and Plate III). This combination of climate, surface, soil, and drainage is the basis for an enormous production of crops and livestock. As we shall presently see, the Corn Belt not only is a highly productive region but also constitutes a market for great quantities of farm machinery, automobiles, foods, clothing, and other goods.

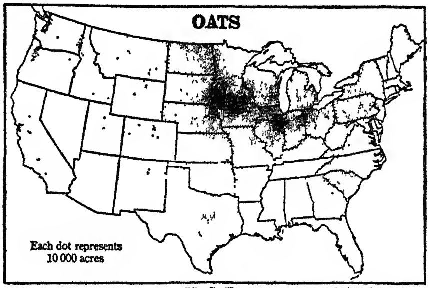

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Fig. 140. Where oats are raised

Operating a Corn-Belt Farm. In planning the use of his land a Corn Belt farmer has three principles in mind. In the first place, he wishes to produce each year about the same amount of corn and other crops in order to feed about the same number of livestock. In the second place, he maintains the productivity of his soil by the use of manure and by growing crops in rotation. Finally, he tries to arrange his crops so that his work is spread as evenly through the season as is practicable. To make the matter clear, let us consider a representative farm in central Indiana. This farm is 160 acres in size and has for years been a financial success.

A Representative Farm. Hillcrest Farm, owned by Farmer X, lies on either side of a state highway. It includes, in addition to the six fields where crops are grown, two wood-lot pastures, a small orchard, and the farmstead (Fig. 142). The house is a nine-room frame struc-

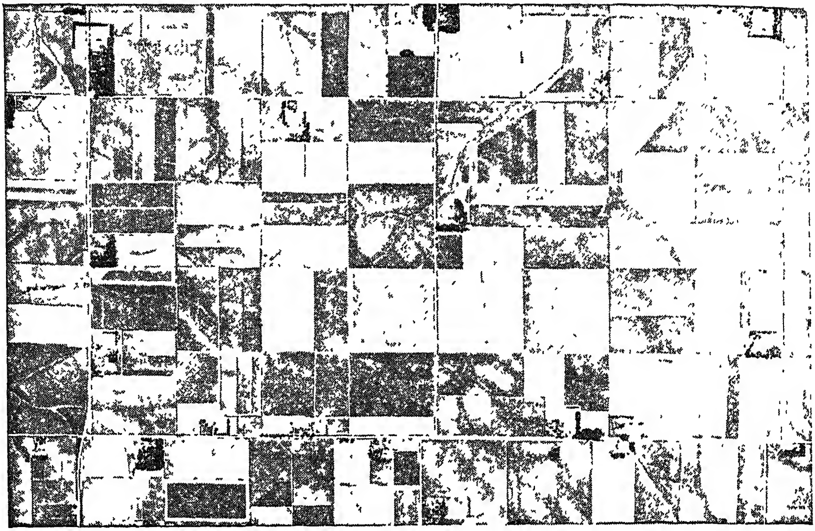


FIG. 141. Field pattern in the Iowa section of the Corn Belt. This picture was taken in Benton County in the east-central part of the state

ture surrounded by a lawn and numerous shade trees. It stands on the broad crest of a low hill and commands a view of nearly all the farm. Not all farm homes in the Corn Belt have modern conveniences; but this one has electric lights, running water, a bathroom, and a furnace.

Livestock. Farmer X ordinarily markets from 100 to 130 pigs and from 20 to 30 head of cattle a year. He keeps from 150 to 300 chickens and sells eggs and poultry. Four dairy cows supply the family with milk, cream, and butter and at times provide butter for sale in the village. Some of his neighbors raise more hogs and fewer cattle, and others more cattle and fewer hogs. As a rule, Corn Belt farmers modify their programs from year to year, according to the price of hogs, cattle, and grain.

Crop combination and crop rotation. To provide sufficient corn to fatten his stock, Farmer X plants from 40 to 44 acres of corn each year (Fig. 142). He devotes a similar acreage to a hay crop, such as clover or timothy, to provide coarse forage for his cattle and horses. On the remaining cultivated land he sows oats or wheat. The wheat, and sometimes part of the oats, are sold off the farm. Taken together, the crops grown on the farm each year—namely, corn, hay, and oats

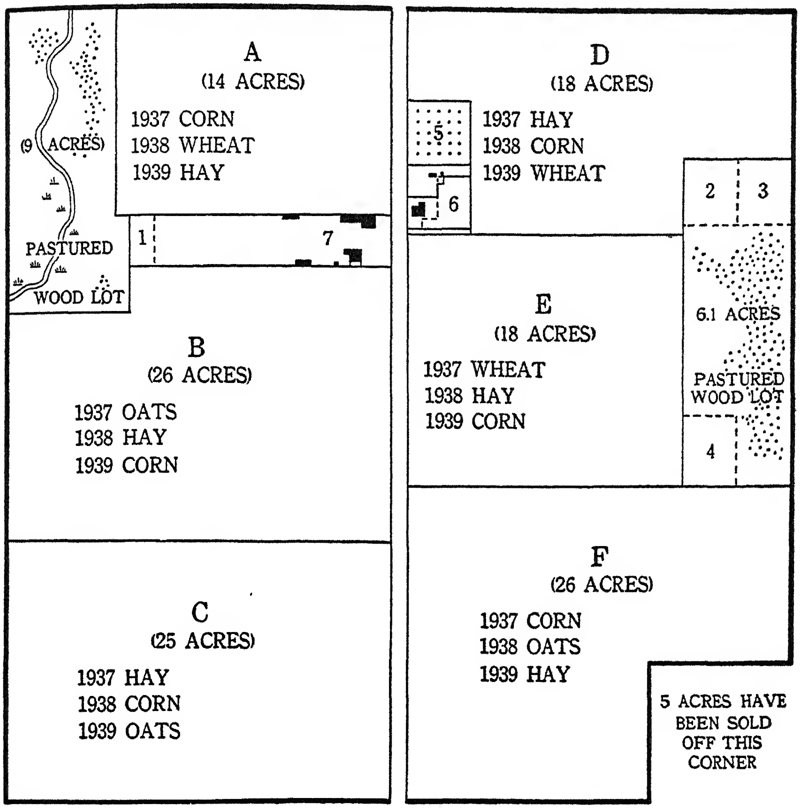


FIG. 142. Hillcrest Farm in central Indiana. 1, 2, 3, and 4 are temporary hog-feeding lots; 5 is orchard; 6 is house and farmstead; and 7 is barns, cribs, and shed. A small stream runs through the larger wood lot

or wheat—make up what is known as a *crop combination.* To maintain the productivity of his land, Farmer X rotates his crops; that is, in each field he grows different crops in succession. Such a series of crops, one following the other in regular order, is called a *crop rotation,* and constitutes one means of using land in a scientific way. In this case the rotation covers a period of three years and is known as a three-year rotation.

Farm improvements. In general, nature has provided the farmer in the Corn Belt with favorable conditions. In some sections, however, he can, by the expenditure of time and money, improve local conditions.

When Farmer X, for example, first began to work his farm, he learned that the middle of field C, being low and poorly drained, could not be plowed as early as the rest of his land. In exceptionally rainy seasons water stood on this low section until so late in the spring that it did not pay to plant a crop. Finally, Farmer X improved the drainage of this low area by laying a line of tile to the brook which flows through the northwest corner of his farm. Since that time he has had no trouble from poor drainage. In the gently rolling landscape of the Corn Belt there are many such depressions, and many ditches have been dug and millions of tiles have been laid to improve the drainage.

From Season to Season on a Corn Belt Farm. Outdoor work on a Corn Belt farm begins as soon as the frost is out of the ground and continues without interruption until the corn is husked in November or December. Even during the winter the farmers are busy feeding and caring for the stock, hauling manure to the fields, repairing buildings or machinery, cutting next season's supply of firewood, or hauling a supply of coal. Farmer X and other Corn Belt farmers endeavor to select their crops so that the various fields will not need attention at the same time. In this way they can work their farms with a smaller amount of help than otherwise would be the case.

Plowing and planting. Farmer X follows the common Corn Belt practice of plowing part of his land in the autumn and part in the spring. Although many Corn Belt farmers plow with a tractor, Farmer X uses four or five horses on his gang plow. His land, like most of the Corn Belt, is level, and the plows turn the crumbly, loamy soil into long, even furrows. As soon as the ground is prepared he begins seeding. He drills in his oats first, because the cool, moist weather of spring favors the early grassy growth of that crop, and light frosts do not harm it. Clover and timothy are sown with the oats, the oats acting as a nurse crop. This means that oats grow rapidly and shade the slow-growing hay crops. The hay crops, in fact, do not become fully mature until the second season. After the oats are in, Farmer X plants his corn with a machine which drops the seeds into two rows at once and arranges them so regularly that there are rows both lengthwise and crosswise of the field. This arrangement aids in cultivating the crop.

Corn Belt weather. After the corn is above ground it grows rapidly, provided the weather is right. As spring grades into summer the days

lengthen, until by late June the sun shines from about four-thirty in the morning until seven-thirty at night. The days are hot; the nights, warm. The air lies quiet and humid. Rays of heat quiver above the ground. Both corn and weeds grow. After a few days of intense heat the hot spell ends in a series of thunderstorms, which supply the moisture needed by the corn. Then the weather changes, and a day or two of bright but somewhat cooler weather prevails. Gradually this phase merges into another spell of hot weather. Such summer weather, combined with the broad area of nearly level, well-drained, and fertile soils, makes an environment admirably suited to corn.

Cultivating. Corn needs cultivation from the time it peeps aboveground until midsummer, when the stalks become so tall that cultivation no longer is needed. During this period the oats and wheat crops require no attention, and the farmer is able to spend most of his time in his cornfields. Commonly the cultivator is drawn by a team of horses; but in some cases large machines, cultivating four rows at a time, are drawn by tractors. The use of these and other machines on Corn Belt farms is made possible by the level nature of the land and the even, friable character of the soil. These characteristics are among the important natural assets of the Corn Belt.

Harvest. In a normal season corn cultivation is over before the wheat and oat harvests begin, but it is likely to overlap with haying time. Farmer X and his men go from one job to another. With careful management, with good breaks in the weather, and, possibly, with some extra help, all the jobs are finished. After the oats and wheat are harvested, threshing follows and fall plowing begins. Throughout September and well into October the corn is left to ripen on the stalk. Then, in the crisp days of late autumn, the corn is harvested with a modern corn picker pulled by a tractor (Fig. 143). At times some of the corn may be harvested and fed by turning hogs into the field.

What Becomes of the Corn Crop. Ordinarily, after the corn is husked it is stored for a time on the farm. The cribs used for storage are of special design, with cracks left between the siding to let air in, so that the corn may dry but not mold (Fig. 144). In most cases, as the corn is hauled from the fields it is unloaded from the wagons into the cribs by a mechanical dumper.

In the northeastern quarter of Illinois much of the corn is sold off the farm. Some of this corn goes to near-by mills and is ground

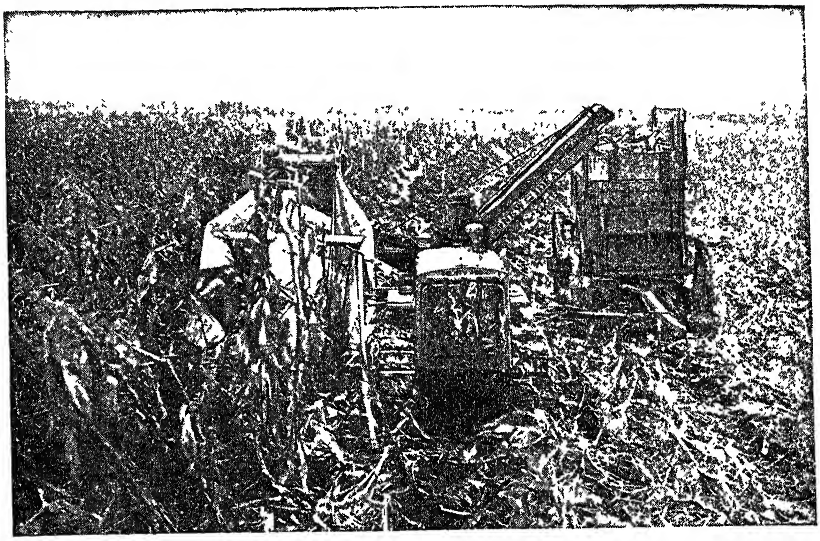


FIG. 143. Harvesting corn in the Corn Belt, near Manito, Illinois. The machine picks and husks the corn and throws the ears into the wagon

into corn meal. Some of it is shipped to factories in Chicago, Peoria, Battle Creek, and elsewhere to be used in making such products as cornstarch, corn sirup, breakfast cereals, salad oil, and butter substitutes.

In most of the Corn Belt the corn crop is fed to livestock on the farms. Some of the stock is bred on the farm and some is shipped in from the Western ranges. Some time in the autumn, for example, Farmer X or his agent makes a trip to Chicago or out to Omaha or Kansas City to purchase 20 or 30 head of Western-range cattle. These, with pigs from the autumn litters, are fattened on corn and clover during the winter. Ordinarily they are ready for market in January or February, but Farmer X may keep them on the farm until later if he has plenty of feed and thinks the price will improve. During the summer the spring litters of pigs are kept in the pastures and, as the season progresses, are fattened on corn in the feeding lots. They are ready for market sometime during the autumn. If Farmer X raises some unusually fine hogs, he may exhibit them at the county fair and even at the state fair before sending them to market.

Selling the Livestock. In some years Farmer X consigns his cattle and hogs to one of the stock markets (Fig. 133); at other times he sells them to an agent of one of the big packing companies or to a

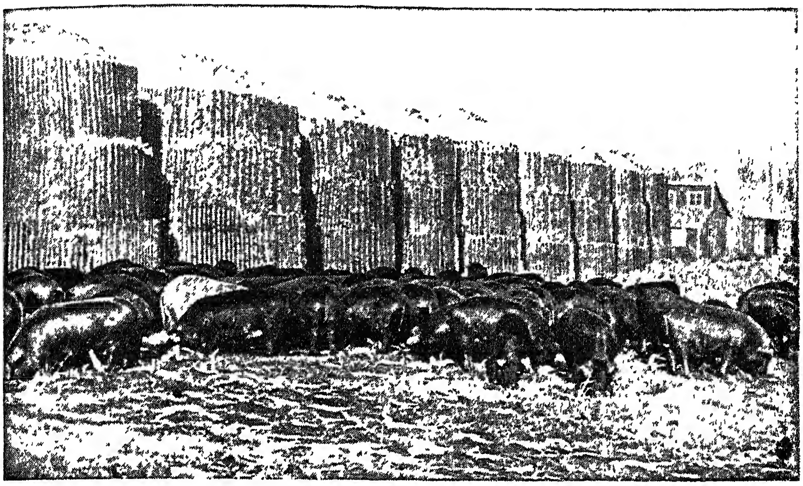


Fig. 144. Corn cribs and hogs on an Iowa farm

local dealer, who combines them with other stock to make up a carload for shipment to Chicago or Indianapolis. With the development of good roads in recent years, increasing numbers of hogs and cattle are delivered to the stock markets by truck. In the autumn, particularly at Thanksgiving and Christmas, Farmer X sells poultry to local dealers.

Corn Belt Villages and Their Functions. Hillcrest Farm lies three miles from the nearest large village and about twice that distance from two smaller ones. At the near-by village, reached by the state road, Farmer X ordinarily ships his stock and crops and buys many of his supplies. To the village he goes for repairs on his car, to have his horses shod, and to do his banking business. His family physician, his dentist, and the agent who sells him insurance on his buildings and machinery have offices there. At the town hall he and his wife vote on election day. His children go to the village to attend the township high school, and there the family goes to church, to the "movies," to ball games, and to parties and other social affairs. Villages of this size and type are characteristic of the Corn Belt, and, in fact, of the entire Middle West (Fig. 145).

Cities of the Corn Belt. Cities of 10,000 inhabitants or more are as characteristic of the Corn Belt as are its farms and villages. Most of these cities are county seats, and nearly all are railway centers of some importance. In general, they are spaced at intervals of approxi-

mately fifty miles. Farmers and people from the villages come to them on occasional shopping expeditions, for hospital services, for business at the county courthouse, and for other purposes. In these cities small shipments of stock, grain, and other farm products are made into larger lots for shipment to metropolitan markets. From some of them, wholesale houses distribute groceries, fruits, machine parts, and supplies of many sorts to retailers in the surrounding territory.

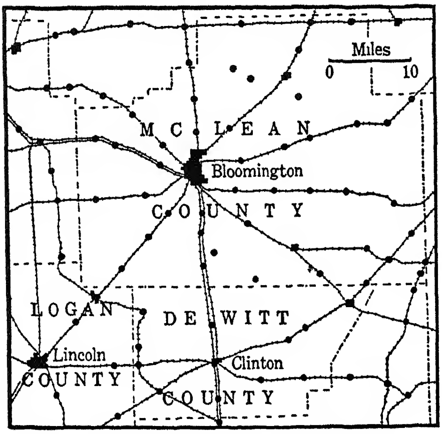


FIG. 145. Cities, villages, and railroads in the Bloomington, Illinois, section of the Corn Belt. The places named are county seats. The dots represent villages. The area covers 2665 square miles

Many of the Corn Belt cities have other functions. Some, for example, are division points on a railroad, and the shops and roundhouses employ large numbers of men. Manufacturing also is a developing feature of many of the Corn Belt cities. Flour mills, packing plants, canning establishments, corn-products factories, and ice-cream distributors utilize some of the farm products routed through these urban centers. In some places brick and tile works use local clays to make brick for building purposes and tile for draining the land. In others there are factories making farm implements and mills turning out sash, doors, and other wood products. Cheap coal, excellent railway services, good living conditions, and, above all, the rich market of the Corn Belt constitute the important assets of these establishments.

QUESTIONS

A. *Our Meat Supply*

1. From the standpoint of the livestock and packing industries, do you live in a producing or a consuming section of the country? What facilities for handling livestock or meat are maintained in your area?
2. What agencies assist in supplying meat to the people of the United States?
3. Why are there many public livestock markets in the Middle West?

4. Why at first were the railways not interested in building cars to carry fresh meat to Eastern markets?

5. Describe and explain the distribution of swine in the United States.

B. *Of the Corn Belt*

1. What is the typical crop combination in the Corn Belt?

2. What is meant by crop rotation? What does it accomplish?

3. Why are there many ditches and tile drainage systems in the Indiana-Illinois section of the Corn Belt?

4. Which lasts longer, the work program on a Corn Belt farm or that on a farm in the Spring Wheat Region? Explain.

5. Compare the Corn Belt with the Spring Wheat Region as to (1) average annual precipitation and (2) length of frost-free season (Figs. 70 and 72).

6. What becomes of the corn produced in most of the Corn Belt? Name a section in which most of the corn is sold off the farm. What happens to this corn?

7. In what ways are the villages of the Corn Belt of service to the farming areas which surround them?

8. Why should there be cities in the Corn Belt?

EXERCISES

1. *A Corn Belt Farm* (*Fig. 142*)

1. Copy and complete the following table, showing the acreage of each crop on Hillcrest Farm in 1937, 1938, and 1939.

Crop	1937	1938	1939
	Acres	*Acres*	*Acres*
Corn			
Hay			
Oats and wheat			

When you have finished the table, study it to find answers for the following questions; then write a composition entitled "Crops and Rotations on Hillcrest Farm."

a. The acreage given in Figure 142 includes the five acres sold off one corner and also the area occupied by the roads. How many acres must be included in the road, the orchard, the farmstead, and the other tracts the areas of which are not given in Figure 142?

b. What percentage of the entire farm was in crops in 1938?

c. What crop followed hay in field B? in field D? in field F?

d. How does the acreage of hay in 1937 compare with the acreage of corn in 1938?

e. Name two kinds of seed which Farmer X may sow for hay. How long does the hay crop grow before he plows it under?

f. What became of each of the crops raised?

g. What was the purpose of the wood lot? the garden? the pasture?

h. In some instances a farmer may raise more corn on 40 acres than he does on 44 acres the following year. Suggest two explanations.

i. Why are tile factories a feature of parts of the Middle West?

2. *Subjects for round-table discussion*

a. Will the United States continue to supply our meat, or shall we increasingly import it from other countries?

b. Is the corn crop or the wheat crop of more importance to us?

CHAPTER XVII

DAIRYING AND THE DAIRY BELT

Extent and Major Divisions of the Dairy Belt. The Dairy Belt extends from Minnesota to the Atlantic and lies partly in Canada

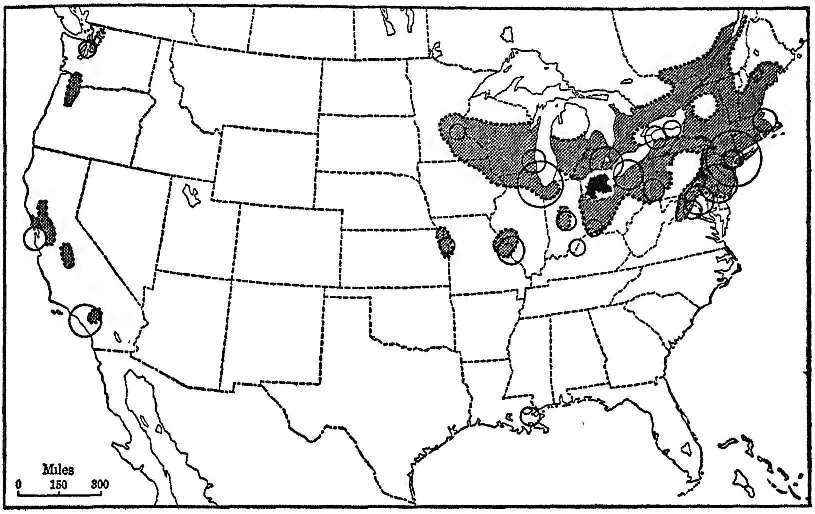
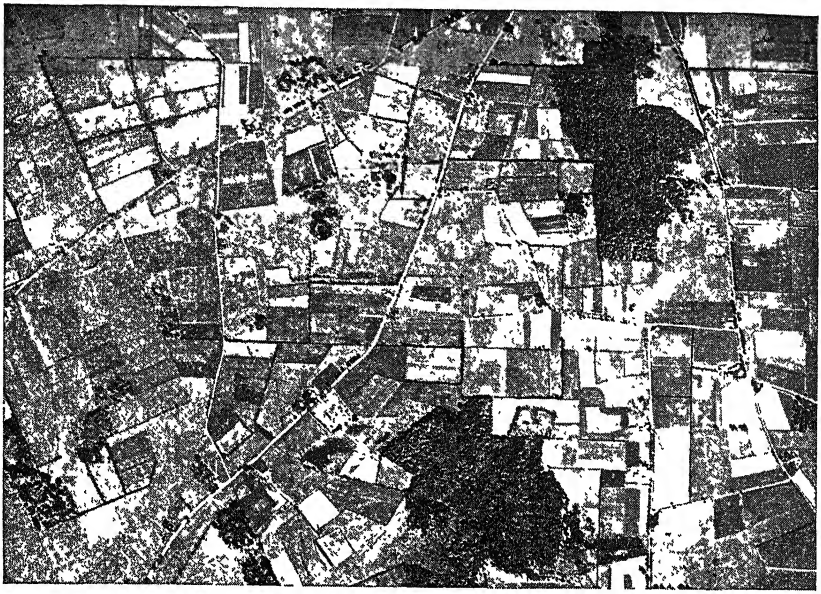


Fig. 146. Dairy-farming areas and principal cities in the United States. Shading shows dairy-farming areas. Size of circles varies with population of cities

(Fig. 146). It covers a larger area than the Corn Belt, but is only three quarters as large as the Cotton Belt. It contains a sixth of the farms of the United States and half the farms of Canada. It is an area of forest soil, rich pasture, big barns, and tower-like silos, and has hundreds of creameries working in rural villages and towns (Fig. 147). The states and provinces lying wholly or partly within the belt account for about half the milk, nearly a fifth of the creamery butter, and 94 per cent of the factory-made cheese produced in the United States and Canada.

The position of the Dairy Belt reflects both market conditions and climate. Within its boundaries or near its margins are most of the large cities of the United States and Canada (Fig. 146), and cities create a demand for dairy products. It has cool, moist summers which stimulate the leafy growth of pasture and fodder crops and which favor the care of dairy products (Figs. 148, 149, and 152).



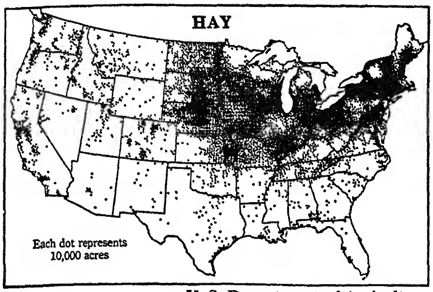
A. A. A.

FIG. 147. A section of the Dairy Belt, Oneida County, New York. A highly irregular field pattern, wooded hills, and much land in pasture and fodder crops are characteristic of the area

In the United States two sections of the Dairy Belt are outstanding (Fig. 149). The first lies in Wisconsin and neighboring parts of Illinois and other lake states and has Metropolitan Chicago for its principal market. The second section is in New York and extends east into New England and south into Eastern Pennsylvania. It has Metropolitan New York as its principal market. In addition to supplying Chicago and other cities with milk and cream, the western section produces most of the creamery butter and much of the cheese of the country (Figs. 150 and 151). Minnesota, Iowa, and Wisconsin lead in butter production, and Wisconsin alone produces more than half the cheese made in the United States. Though the eastern section of the Dairy Belt produces some cheese and butter, the greater part of its dairy output goes as fresh milk and cream to Boston, New York, Philadelphia, Baltimore, and other cities of the Eastern Seaboard.

Variety within the Belt. The Dairy Belt has a variety of interests, both agricultural and nonagricultural. Many dairy farmers keep pigs and poultry as well as cattle. The Dairy Belt contains some of our leading horticultural districts (Fig. 107), some small tobacco districts,

and some general-farming areas where dairying is simply one of several farm interests. The Dairy Belt, like the country north of it, contains much land too stony, too rough, too sandy, or too poorly drained for farm use. About half the United States portion of the belt is forest or cutover land, the larger tracts being chiefly along the northern margin. Some forested or partly forested areas have been set aside as state or national forests, others are held by railroad or lumber companies, and some unproductive cutover tracts have been abandoned by their former owners to avoid paying taxes on them. The unfarmed land has a value of its own; for wooded hills, quiet lakes, and pleasant streams, together with the cool summer weather, attract to the northern portion of the Dairy Belt many vacationists from near-by cities and from the South.



U. S. Department of Agriculture

FIG. 148. Where hay is raised

The Dairy Farm. A representative farm in the Dairy Belt includes some cropland, some pasture, and some woodland. Many farms have a pond or swamp, and in many cases a brook flowing through the pasture furnishes water for the cattle. The farmsteads, with their white houses, big red barns, and tall silos, appear in a pleasant setting of green trees, hayfields, and meadows. At harvest time the prevailing green is relieved by the yellow of oats or rye fields, and later the woods take on the red, gold, and brown of autumn. In winter the deep snow cover spread over the land emphasizes the presence of evergreen trees and shrubs in the woodland. Crews of men and snowplows keep the main roads open, and trucks collect the cans of milk placed conveniently on platforms at the roadside in front of the farmhouses. When the branch roads are covered with snow, some milk is hauled in sleighs to the main roads.

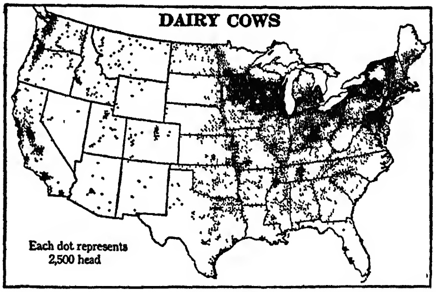


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FIG. 149. Dairy cattle in the United States

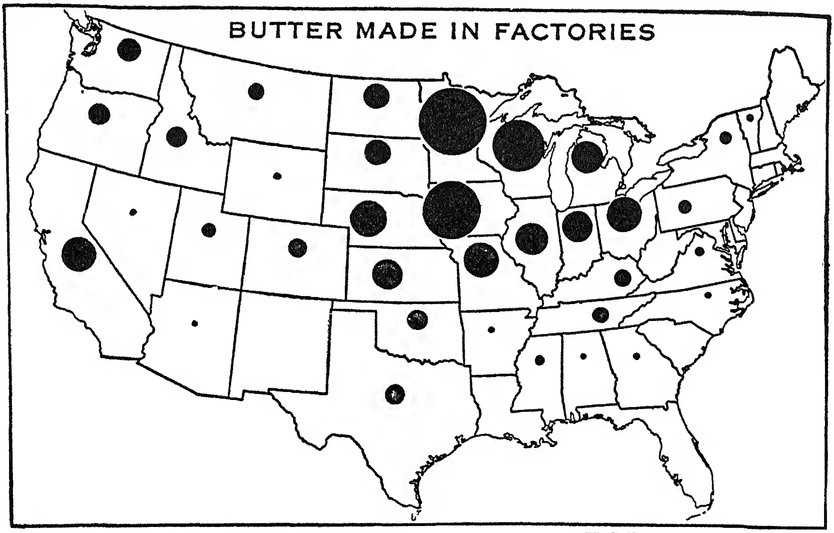

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Fig. 150. Butter made in factories by states. Circles show relative production in a recent year

Crops and Pastures. The dairy cow turns pasture grass, hay, and grain or grain by-products into milk, an excellent food for people. Dairying, therefore, flourishes where cool, moist weather keeps the pastures green throughout the summer season and where hay, grain, or some other feed can be grown (Figs. 149 and 152). The amount of milk produced by a well-fed cow varies with the breed and differs among individuals of the same breed. The average annual yield per dairy cow for the whole country is about two tons of milk rich enough to make one pound of butter for every 25 pounds of milk. But the cows of the best dairy herds average two or three times as much. Thus they give the dairy farmers much higher returns for the feed which they consume.

Ordinarily the dairy farmer keeps more than half his arable land in pasture. In summer the cattle graze in the pastures, commonly feeding in one pasture lot and then another. In allowing his cattle to graze as long as the pastures remain green, the farmer uses the cheapest way of feeding them and also the best, for juicy green feed favors milk production. After the end of the growing season he must feed the cattle on hay, clover, alfalfa, or other fodder grown during the summer. The need for keeping such bulky products under cover accounts for the huge barns characteristic of many dairy areas.

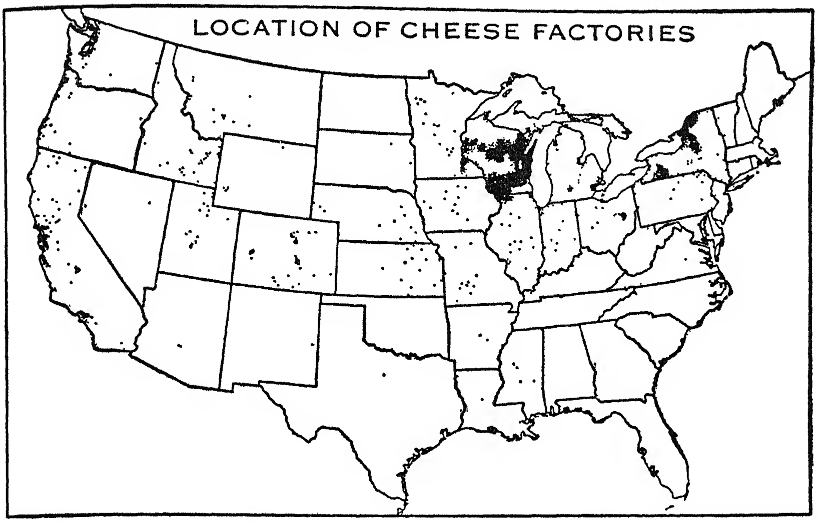

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FIG. 151. Cheese factories in the United States

How to feed the cattle is the big problem on the dairy farm, particularly how to feed them so that the yield of milk may not fall off greatly in winter. A few decades ago people expected milk and butter to be plentiful and cheap in early summer, the season of lush pastures, and to be scarce and expensive in winter, the season of dry feed for stock. Even now the creameries of the country, dependent on the milk yield of the farms, make less butter in winter than in summer (Fig. 153). The dairy farmer wishes to have a regular output month after month, and, in addition to hay, he may feed corn, barley, or some root crop such as turnips.

The silo of the Dairy Belt represents progress toward solving the problem of winter feed. Corn or some other crop is cut green and placed in a silo, where it ferments into ensilage, a juicy feed much liked by cattle, and valued by the dairy farmer for its effect on milk production. Besides providing feed nearly as good as that of summer pastures, the practice of filling silos enables the dairy farmer to grow corn in northerly areas where frost comes too early for the grain to ripen.

Products of Dairy Farms. The dairy farmer may sell milk, cream, butter, or cheese as his principal cash product. In reality, the output of the dairy herds generally leaves the farms as milk or cream. Amer-

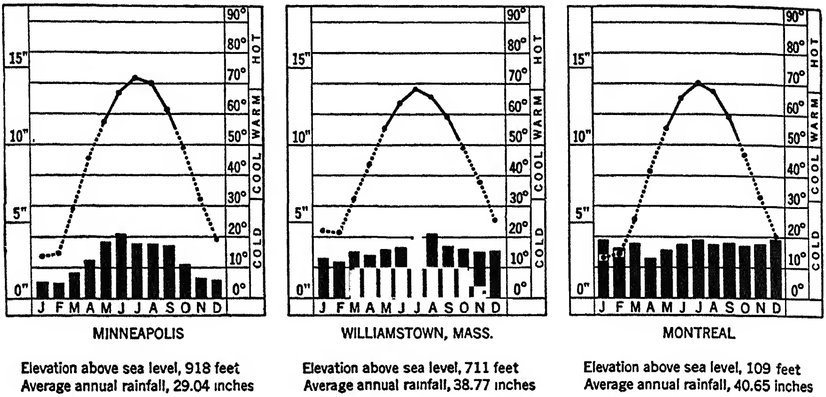


FIG. 152. Temperature and precipitation in three sections of the Dairy Belt: Minneapolis, Minnesota; Williamstown, Massachusetts; and Montreal, Canada

ican farms produce relatively little butter for sale and practically no cheese. Certain other commodities may be considered as being in part by-products of the dairy industry. Cows that do not give profitable amounts of milk may be sold for beef, and each year many young calves go from dairy farms to packing plants to be slaughtered for veal. The states of the Dairy Belt produce about a third of the country's eggs and much of the poultry consumed in our cities.

About 40 per cent of the milk of American dairy herds leaves the farms as liquid milk. Part of this amount goes to consumers in towns and cities and part goes to factories. Fresh milk for use by city people comes in most cases from farms near the cities or along railroads and highways leading directly into the cities. Improvements in transportation, when they occur, widen the areas from which the cities may draw milk.

About a third of the milk produced in the United States is skimmed or separated on the farms and the cream sold; the skimmed milk remains on the farm to be fed to calves, pigs, or poultry. In some cases the farmer hauls the cream to the factory, but very commonly a truck operated by the creamery collects the cream two or three times a week. Cheese factories and some creameries buy whole milk, and this practice calls for daily collections. In all cases cool summers are a valuable asset for dairy districts, as it is easier to keep milk sweet in cool weather. Most of the creameries and cheese factories are small plants located in milk-producing areas, but in

Month	Million Pounds	Month	Million Pounds
January	120	July	175
February	111	August	165
March	127	September	144
April	136	October	134
May	178	November	113
June	185	December	106

FIG. 153. Butter made in creameries during each month of a recent year

many cases their output is sold through firms whose widely advertised brands have almost a national sale.

Numerous manufacturing industries consume milk and cream as raw materials. Manufacturers of milk chocolate in New York and Pennsylvania consume much milk, and so do manufacturers of malted milk and of the casein used in dyeing and in making paint and enameled paper. Ice-cream factories in our cities produce for both city and village customers, and thus cream may travel into town and then out again in this palatable form. In several manufactured forms, such as evaporated milk and powdered milk, the product of the dairy herd has ceased to be readily perishable and has become suitable for long-distance shipment. Rather large quantities of evaporated and condensed milk (chiefly the former) go as exports to Tropical America, and smaller quantities are shipped to the Orient, chiefly the Philippines and China. The Dairy Belt produces more than two thirds of the evaporated and condensed milk of the country, but the states on the Pacific Coast, with their smaller populations, produce more than half the export volume.

Cities and Their Effect on the Dairy Industry. More people live in the area mapped as the Dairy Belt in Figure 146 than in any other agricultural division of the country. Four fifths of the people live in the cities of the belt and thus rank as customers of the dairy farmers. Without their steady demand the dairy industry could not flourish. A rapidly growing city, therefore, stimulates the dairy business. Detroit's recent rise to the status of a great city had just that effect on the dairy farming in southeastern Michigan. Metropolitan New York, the greatest urban consuming area in the country, draws its supply from 30,000 farms in six different states and from Canada; but three fourths of the total comes from New York State. Some of

the milk is hauled more than 300 miles, and New York buys cream from states even as far west as Michigan and Wisconsin. Collecting from such distances demands careful and rapid handling in order that the products may reach consumers in first-class condition.

Safeguarding and Transporting Our Milk Supply. Knowing the importance of milk as food, many states have passed laws requiring that dairy herds be inspected regularly and that no milk from diseased cows be sold. On a modern dairy farm the milking is done night and morning under sanitary conditions, and the milk is cooled immediately to prevent its turning sour. Commonly the milk is hauled in sterilized cans to a near-by loading station. Thence it may go by truck over improved highways direct to the city plant of a dairy company; but if the distance is more than 75 miles, it is likely to be shipped by rail. The use of glass-lined tanks installed in refrigerated railway cars and of glass-lined tank trucks marks a great advance in the facilities for shipping milk, since glass can be cleaned more thoroughly than most substances.

The dairy company receives milk and cream in bulk at its city plant and prepares them for distribution to its customers. The milk and cream are put in bottles marked with the company's name and are either delivered at the customer's door or marketed through grocery stores and delicatessens. Though we are inclined to take it for granted, a regular city-wide supply of these perishable products really is one of the marvels of modern life.

QUESTIONS

Dairy products and dairy farms

1. Why is it good practice for dairy farmers in northern New York to plant corn even though the grain is likely not to ripen before the first autumn frost?

2. Minnesota produces twice as much milk as the six New England States together. Explain why it produces more than sixty times as much butter.

3. Which is more likely to find a silo profitable, a dairy farmer near Detroit or one near Los Angeles? Why? (See page 211 and Fig. 72.)

4. Why does Boston buy more milk from Maine than does New York?

5. It is estimated that 80 per cent of the calves sold for veal come from dairy farms. Why?

6. Many city people spend their summers in northern Michigan. What difference does that fact make to dairy farmers in the same part of the state?

7. A group of American engineers in a Venezuela petroleum field use Wisconsin milk in their coffee. How is that possible?

8. Factories in New York and Pennsylvania prepare more evaporated milk than do all the factories in California, Oregon, and Washington together. But San Francisco and Seattle together export more evaporated milk than goes out through all our Atlantic ports. Why?

9. In which three-month period, as the year is divided in Figure 153, do the creameries of the United States make most butter? How is this related to climate?

10. Can the year be divided in any way so as to bring together three months with a still larger output?

11. In which three-month period do the creameries make least butter? What bearing has climate on this fact?

EXERCISE

Our supply of dairy products—an outline

Prepare an outline of Chapter XVII. Let your outline contain headings of two ranks, though headings of only one rank are printed in the book. In order to do this, you will find appropriate titles for all paragraphs, whether they have printed titles (or headings) or not. For example, the first major heading, "Extent and major divisions of the Dairy Belt," belongs to three paragraphs and therefore should have three secondary headings under it. As a heading for the first paragraph you might choose "Size and importance of the Dairy Belt"; for the second, "Reasons for the location of the Dairy Belt." As the heading "Variety within the belt" has only one paragraph under it, you will not give it any subheadings.

CHAPTER XVIII

COTTON

1. *Cotton in World Trade*

Universal Demand for Cotton Cloth. An American explorer in a remote section of Belgian Congo came upon a tribe of natives who have but little contact with the outside world. In reward for a small service the traveler presented a native with a strip of cotton cloth. Thereby the native became an envied person in the village. Cloth of any kind is so scarce in this remote section of the world that possession of even a small piece of it brings distinction to its owner.

The desire for cloth for clothing and adornment is universal among people. The demand for it appears in every country. Cotton goods are on sale in practically all parts of the Commercial World, and gaily colored cottons long have been considered standard equipment for traders among primitive peoples. Cloth is wanted by almost everybody and therefore is a sort of universal language.

Where Cotton Goods Are Manufactured. Although cotton is worn or used in some form by nearly all people, cotton goods are manufactured in a commercial way mainly in Western Europe and Eastern United States. In these lands bordering the North Atlantic, cotton goods are manufactured in large quantities, in great variety, and at low cost. From them cottons are exported to most parts of the world. Outside the lands bordering the North Atlantic, the leading cotton-manufacturing countries are Japan, India, and the Soviet Union.

Where Cotton Is Grown. For more than a century the United States has been the leading producer of raw cotton, and this country normally produces about 40 per cent of the world's cotton crop (Fig. 154). European and Japanese mills, as well as our own, depend in large measure upon our Cotton Belt for their supply of this important raw material. Though the growing of cotton for export has spread to many tropical countries in recent years, the United States still ships about half the cotton of international trade. India and Egypt are the other countries contributing raw cotton in large amounts to the textile districts. Soviet Asia, Brazil, Peru, and Mexico produce considerable quantities of raw cotton, but the amount is small in comparison with that of the United States. China has a sizable cotton crop, but much of it is spun into yarn and woven into cloth on hand

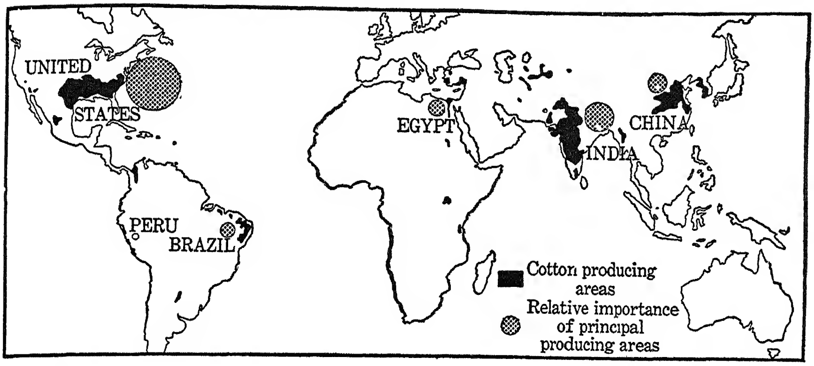


Fig. 154. Principal cotton-producing areas of the world. Circles show relative production in a representative year

looms in Chinese homes or in mills that produce for domestic markets. Therefore it does not enter trade to any great extent.

British Trade in Cotton Goods. The Manchester District of England, more than any other cotton-manufacturing district in the world, produces cotton goods for people of other countries (Fig. 155). In value, its spindles and looms turn out more than a third of the cotton goods entering international trade. In fact, the export trade is the lifeblood of the English industry, for in most years more than 50 per cent of the total output is exported. It has been claimed that Great Britain exports cotton goods to every country in the world.

Continental Trade in Cotton Goods. Cotton mills on the continent of Europe produce largely for domestic markets. Cottons produced in Germany command the home market and also are exported in considerable quantity. Italian cotton-manufacturing has developed in response to a large domestic demand, and there is an increasing export of low-grade cottons. French mills turn out fine cottons for the high-quality trade at home and abroad. They also make cheap cottons for home use and cheap heavy fabrics for the French colonies. Swiss embroidery and other cotton wares likewise are widely distributed. All in all, however, the Continental business is domestic in character, and thus it stands in contrast to the great export trade of Great Britain.

American Cotton Trade. Although the mills of the United States consume more raw cotton than those of any other country, they sell mainly to our own market. In most years less than 10 per cent of our

total production is exported. Our oversea cotton trade, therefore, depends largely upon our huge exports of raw cotton, rather than upon shipments of cotton goods. Since the exports go to oversea countries, it is a convenient and fortunate circumstance that our Cotton Belt lies near the seaboard.

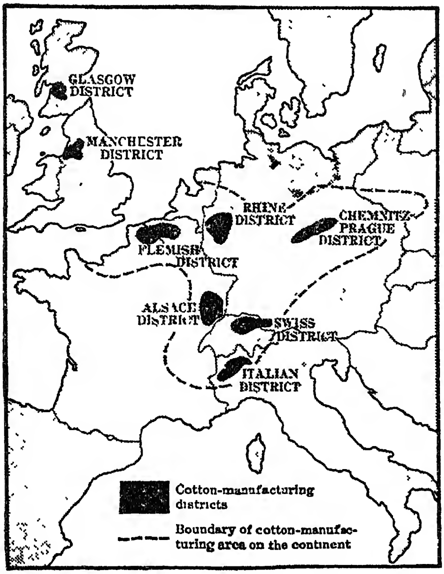


Fig. 155. Cotton-manufacturing districts and centers of Western Europe

British mills import much of their raw cotton from the United States. Our Cotton Belt, therefore, has a vital interest in the status of the British textile mills, and they in turn have an interest in the Cotton Belt. The continued success of Great Britain's factories depends largely upon their ability to export cotton yarn and cloth. Since India and Australia are their major markets, it is clear that our Cotton Belt farmers, the British textile-workers, and the people of India and many other lands are linked together by their common interest in the greatest of the textiles. In recent years Japan has made a big effort to take this Asiatic trade from Great Britain.

Rank of Cotton in Oversea Trade. Although raw cotton is exported from only a few countries, it is the most valuable agricultural commodity in international trade, outranking such trade giants as sugar, wheat, wool, and meat. Furthermore, if we consider the oversea trade in raw and manufactured cotton together, cotton becomes the most valuable ocean-borne commodity.

The general framework of the cotton trade now is apparent and may be summarized as follows:

1. Three countries—the United States, India, and Egypt—produce most of the raw cotton entering international trade, the United States producing about half the total.

2. Nearly half the United States crop is consumed by American mills. Most of the remainder is exported to Western Europe and Japan.

3. The Manchester District of England manufactures for export to all countries, with India and Australasia as its chief customers.

4. Cotton mills in the United States produce mainly for our own market.

5. Mills on the continent of Europe produce mainly for European needs, but have a growing export trade.

6. Japanese mills produce mainly for East Asian markets.

7. India and China, with their huge populations, have imported large quantities of manufactured cottons for many years.

2. *Cotton and the Cotton Belt*

Cotton Culture Favored by Natural Conditions in the Cotton Belt. The enormous production of cotton in the United States reflects the fact that natural conditions favorable to cotton prevail over a huge section of this country. The Cotton Belt, as outlined in Figure 156, measures approximately 1500 miles from southwest to northeast and includes about 470,000 square miles. In this vast area the summer is long and sunny, yet moist, the surface is level and the soil is fertile. Cotton does well under such conditions and is the major crop of the region. In some parts of the belt, however, the land is too rough, too poorly drained, or too infertile for cotton, and in others the land is devoted to tobacco, peanuts, vegetables, or some other crop.

Margins of the Cotton Belt. The general boundaries of the Cotton Belt are imposed by nature (Fig. 156). At the north cotton culture is limited by the shortness of the growing season. Cotton requires from five to six months to complete its growth, and the harvest continues for an additional two or three months. This requirement eliminates cotton from serious consideration in the short growing season of the northern part of the United States (Figs. 72 and 128). At the west, cotton culture is limited by aridity. Beyond the western margin of the belt the average annual rainfall is less than 23 inches (Fig. 70), and in many years the crop, if planted, is injured by drought. At the south and east, cotton culture does not extend to the coast, in part because the soils are too sandy or too poorly drained for cotton and in part because heavy autumn rains near the Gulf damage the lint and interfere with picking.

Major Producing Areas. Three sections of the Cotton Belt are noted for their large production of cotton (Fig. 156). The most easterly and oldest section extends from central Alabama to the northern part of North Carolina. In this section the areas about

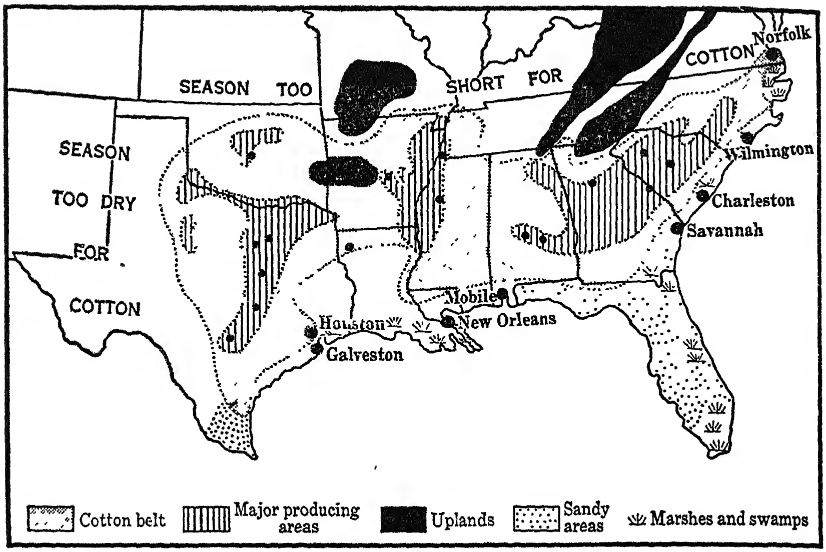


FIG. 156. The Cotton Belt, showing the major producing districts and the conditions which limit the spread of cotton culture

Montgomery, Atlanta, Augusta, Greenville, and Columbia long have been known for their interest in the crop. The second section lies in the Mississippi Valley between northeastern Arkansas and northeastern Louisiana and extends for some distance up the valley of the Arkansas. Memphis and Little Rock are the most important centers in this section. The third section extends in an irregular area from San Antonio to the northeastern border of Texas. The presence of such important markets as San Antonio, Austin, Waco, Fort Worth, and Dallas reflects the importance and prosperity of this area.

The Alabama-Georgia-Carolina area. The area of large cotton production in Alabama, Georgia, and the Carolinas lies between the Appalachian Highland on the northwest and the forested sea-border belt on the southeast. In general, the land is level enough for cultivation, but along the streams the slopes are steep and many are wooded. The soils vary greatly in quality, but in some areas they are of high fertility. As this is the oldest section of the Cotton Belt, the soil has lost something of its virgin fertility, and large quantities of fertilizers are used to increase its productivity. In some instances cotton is grown on large plantations, but in most places the farms are of moderate size and are worked either by the owner or by share croppers.

Philip D. Gendreau, N. Y

Fig. 157. Picking cotton in southern Mississippi

Alluvial plains of the Mississippi Valley. In the Mississippi Valley between Memphis and Vicksburg much of the land is in large estates. The cultivated areas are interrupted by tree-bordered watercourses and lakes, for the region is drained by a network of sluggish streams. In general, crop yields are high; for these alluvial plains, built up by the Mississippi River and its tributaries, have extremely fertile soils. Much of the area would be flooded at times of high water were it not for the levees, which hold the rivers in their courses. Additional areas may in time become available for cultivation if the engineers find a way and the money to drain them.

The black waxy prairie of Texas. The major cotton-growing section of Texas displays a broad, open prairie landscape. The land is broadly level, the black waxy grassland soils are of notable fertility, and in many places one gains an impression of continuous cultivation. Though there are some large landholdings, a representative farm contains about 140 acres. On such a farm cotton is planted on about 50 to 70 acres, while other crops occupy perhaps from 20 to 30 acres. Most farms are worked by owners or by tenants who rent the land.

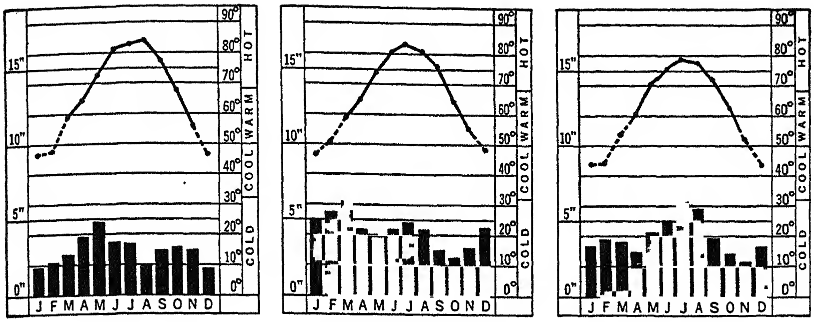
What Cotton-Belt Farmers Raise. Cotton is so important in the Cotton Belt that many farmers operate on a one-crop system. This means that cotton is the crop raised to sell, though others may be

grown for home use. Corn is grown almost as commonly as cotton, but the acreage per farm is much less. In many instances the farmer keeps a cow and a few hogs and plants a garden. On well-managed farms, after a field has been in cotton for two or three seasons it is planted to cowpeas or velvet beans or some other crop which adds nitrogen to the soil. These crops may be fed to cattle, but in many instances they are plowed under to assist in maintaining soil fertility. In some sections the diversification of crops has been stimulated by losses from the boll weevil. This pest attacks the bolls and spoils the fiber and so reduces the yield and profits of cotton culture that farmers are forced to try other crops. No crop has been found, however, which sells as well as cotton.

The Cotton Crop in Its Seasonal Setting. The Cotton Belt farmer is busy through most of the year. Each season finds him employed with a different phase of the important task of producing his share of the world's cotton. In general, his work divides into three jobs and three periods. In the early spring he prepares his land and plants his crops. Summer finds him engaged in the arduous task of hoeing and cultivating his corn and cotton. In the autumn his cotton must be picked and hauled to market. Each of these phases of his work is favored or hindered by the character of the weather during the season.

Planting favored by early spring. Since the Cotton Belt winters are mild and spring comes early, work begins in February, or even earlier if the land is dry enough (Fig. 158). If a field has been in cotton the previous season, the first job is to break or cut the old stalks, which are then plowed under or burned. If fertilizer is used, it is applied before plowing the land. In anticipation of planting, the farmer purchases seed either from a local gin or from some agency selling carefully tested seed. The latter is considered a wiser practice, for, other things being equal, the better the seed the larger the crop. As a rule, a farmer plows his land in March and plants his crop early in April. By April the weather is mild, and light showers are frequent. Under such conditions the seeds sprout and the young plants grow rapidly. After the cotton is well up, men chop out some of the plants with hoes, leaving plants from ten inches to two feet apart in the rows.

Summer growth demands sunshine and rain. One of the major assets for cotton culture possessed by the Cotton Belt is its summer



FORT WORTH, TEXAS
Elevation above sea level, 670 feet
Average annual rainfall, 33 inches

MONTGOMERY, ALABAMA
Elevation above sea level, 240 feet
Average annual rainfall, 51 inches

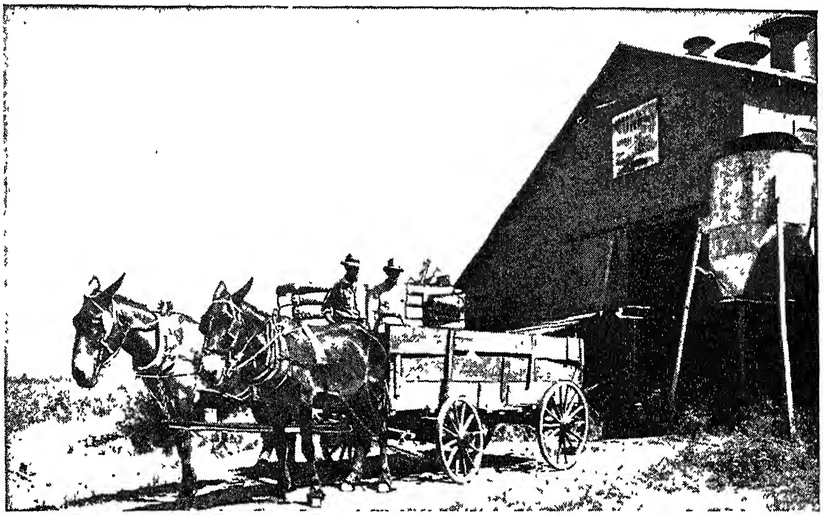
FAYETTEVILLE, N.C.
Elevation above sea level, 170 feet
Average annual rainfall, 47.60 inches

Fig. 158. Temperature and precipitation at Fort Worth, Texas; Montgomery, Alabama; and Fayetteville, North Carolina

weather. By early May the air becomes warm and humid. The weather is characterized less by extreme heat than by continuous warmth, for the nights as well as the days are warm. Much of the rain falls during thundershowers, and the bright sunshine returns between the rains. The farmers are pleased if it rains at night, so as not to cut off the sunshine of the day, for the cotton plant thrives under sunshine. When we speak of "the Sunny South" we refer to one of the conditions which make the South a fine region for cotton culture.

Under the sunny, showery weather of early summer the cotton crop grows rapidly. Weeds do likewise. As a result, frequent cultivations are necessary to stir the soil and to keep down the weeds. As a rule, a man with a mule and a cultivator can cultivate about 20 acres, and so a farmer with 80 acres in cotton needs four men, four mules, and four cultivators. Corn and other crops, if grown, have to be worked in the intervals between the several cultivations given the cotton crop. As cotton is his money crop, the farmer naturally gives it first attention, and in some areas he grows little else.

Ripening occurs as heat and moisture moderate. After a few weeks of growth the cotton plant develops into a low bush and begins to blossom. In two or three days the blossom drops off, leaving tiny bolls in which later the seeds and fiber develop. As the plant continues its growth, new branches, new leaves, and new blossoms appear above the earlier growth. This process is repeated until the plants attain their full height of from 3 to 8 feet, depending on the variety and the



Philip D. Gendreau, N.Y.

FIG. 159. Loading cotton for shipment at a cotton-ginning plant in Tennessee

locality. As the season advances, there is a gradual modification of the weather. Less rain falls, and although the days continue warm, the nights are somewhat cooler. Under these conditions the leafy growth of the plants is checked, and seeds and fiber develop in the bolls. Sometime in August (depending on the locality) the lower bolls burst and picking begins.

Harvest favored by mild dry autumn. The picking season continues from late August to December or even January. The prolonged harvest season grows out of the fact that not all the bolls ripen at once. The lower bolls open first, followed in turn by the middle and upper bolls. Thus a picking crew may go over a field three or four times (Fig. 157). This is the busiest season of the year, and the farmer needs considerable extra help. In many cases the schools are closed, and every member of the farmer's family old enough to pick is in the field. Farmers working large holdings employ every available hand, and gangs of workers may be brought from a near-by city. Continued mild dry weather is a great boon; for a severe early frost damages the crop, and an unusual amount of rain delays the picking and injures the lint.

Marketing the Cotton Crop. Millions of bales of cotton move from Cotton Belt farms to the world's cotton mills in a normal year. This big task calls for an efficient marketing system. Cotton gins

and cotton-buyers operate in nearly every village of the Cotton Belt. From these villages the cotton moves to centrally located cities, where it is graded and the bales are compressed for shipment. Here also are mills for extracting the oil and meal from the cottonseed. From these cities "f.o.b. men" consign the cotton to American factories or to exporters in our cotton ports. Villages, cities, mill towns, and ports are tied together by the network of railroads which serve the South (Figs. 89 and 95). Through long experience the Cotton Belt is organized to produce and market its major crop.

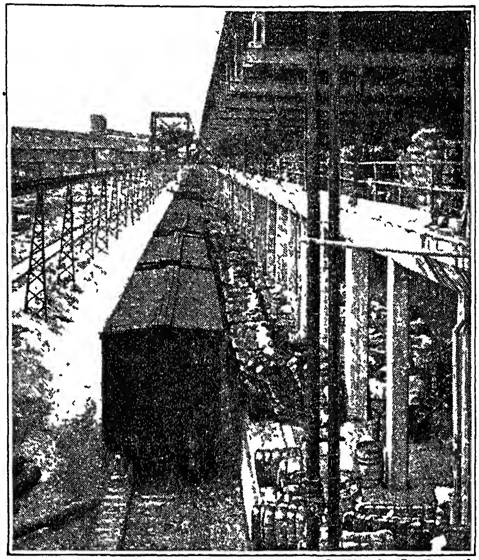


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FIG. 160. A cotton terminal at New Orleans

The cotton gin and the village buyer. Commonly, when a farmer has picked enough cotton to make up a 500-pound bale, he hauls it to a near-by gin (Fig. 159). A pneumatic tube sucks the cotton out of the farmer's wagon and distributes it to the ginning machines, or gin stands, as they are called. These justly famous machines separate the seeds from the lint. Another blast of air then carries the lint to the baling press, leaving the seeds to be shipped to a crushing mill. Once baled, the cotton is ready for shipment. It may then be bought by the owner of the gin or be delivered to the farmer. In the latter case the farmer usually sells to a buyer. In the Carolinas and Georgia much cotton is sold directly to the cotton mills.

Central markets. A buyer in a Cotton Belt village commonly sells the cotton he purchases during the day to a firm in a near-by city. Thus cotton fiber from many communities comes together in a central market. Here the bales are sorted into grades established by the Federal government. Such classification is necessary because raw cotton ranges through many varieties, and each cotton mill requires particular varieties to make the kind of yarn or cloth it turns out.

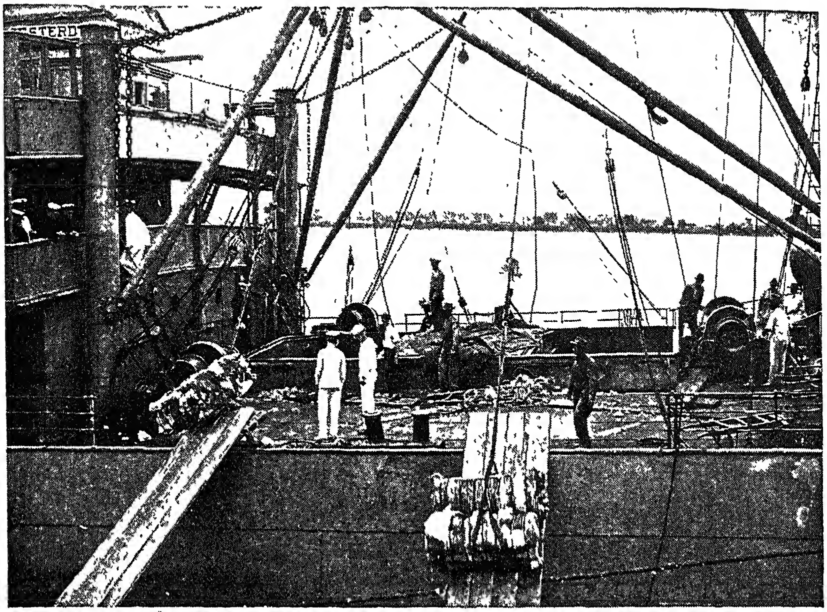

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FIG. 161. A tramp vessel loading cotton at New Orleans. Some of the cotton bales come to the port in river boats and some by rail. Export shipments commonly are heavy in the months following the harvest

Coastwise and oversea shipments. Cotton destined for a Southern mill is shipped by rail; but if bought by a New England mill, it may either move by rail all the way or go by rail to the coast and then be shipped by steamer to a New England port. Such sea trade is called coastwise trade to distinguish it from the traffic moving overseas. Goods can be shipped from one United States port to another only in a vessel flying the American flag, but oversea shipments may be carried by a ship of any nation.

Our major cotton ports. Raw cotton, en route from American farms and plantations to European mills, leaves the United States through many ports and on many ships (Figs. 156 and 161). Liners sailing on scheduled time carry cotton as part cargo, and many tramp ships call at our Southern ports primarily to load cotton. More than half this export stream originates at three ports: Galveston-Houston, New Orleans, and Savannah. Each owes its importance to its proximity to a leading producing section of the Cotton Belt (Fig. 156).

3. *Cotton-Manufacturing*

Carding, Spinning, and Weaving. There are several stages in the manufacture of cotton, each of which requires special machinery. After the bales of raw cotton reach the mill they are broken open and leaves and other dirt removed. Then the jumbled mass of fiber is combed with iron brushes, or cards, to take out the short or imperfect fiber and to arrange the good fiber in parallel fashion. The fiber next passes through a funnel, coming out as a soft, untwisted, ropelike strand about the size of a man's thumb. A number of these strands, after further treatment, are twisted into firm yarn, either on a spinning mule or on a ring spindle. Yarn is woven into cloth on a power loom. In some cases carding, spinning, and weaving all go forward in one mill, but commonly spinning and weaving take place in separate mills.

The Finishing Trades. Even after cloth comes from the looms, a number of operations are required before it is ready for the market. These operations are spoken of as "finishing" or as the "finishing trades" and include bleaching, dyeing, mercerizing, and printing. In the bleaching process the dirty-gray cloth from the looms is washed in boiling water and then boiled in a chemical solution to remove the grease and dirt. Then it is bleached with chloride of lime and washed again. Afterward the white cloth is starched, dyed, printed, or otherwise treated, according to the purpose for which it is intended. All these operations require special equipment and special processes. For this reason most manufacturers, instead of finishing their own goods, ship them to a big plant which finishes the output of many textile mills. Large quantities of pure, clean water are needed in the finishing operations, and this fact has had an important bearing on the location of the finishing plants.

Cotton-Manufacturing in Great Britain. The Manchester District in England is the leading cotton-manufacturing district in the world. Here cotton-manufacturing first developed on a machine basis; here are 90 per cent of the spindles in Great Britain and more than a fourth of those in the world; and here cotton goods of great variety and in great quantity are produced. The district is about the size of a Middle Western county, being approximately 30 miles by 25 miles (Fig. 162). Manchester is the business center. Over its docks and through its warehouses raw cotton moves to the milling towns. In addition, the

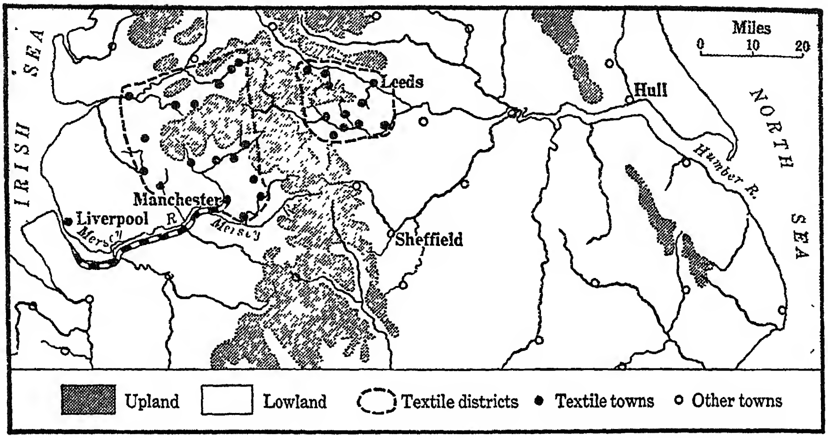

FIG. 162. Textile-manufacturing districts of Central England

manufacturers maintain their offices in Manchester, and buyers from many nations come to them to purchase the finished product.

The high rank of the Manchester District depends upon several conditions. First, British cotton goods are well and favorably known in world markets, the basis for this enviable reputation being laid during the half century (1750–1800) when Great Britain was the only country making cotton goods on a factory basis. Second, the spinning jenny, the power loom, and other textile machines were invented in the Manchester District and were first put to work there. Third, the streams tumbling down the rainy west flank of the Pennine Range provide water power and the pure, clean water needed by the finishing trades (Fig. 163). Fourth, the moist air prevailing in the district favors the handling of cotton fiber. Fifth, rich seams of coal underlie the area and furnish cheap power for the mills and factories. Finally, the coastal position of the district is of prime importance in shipping goods to oversea markets.

Cotton-Manufacturing in the United States. Nearly a half-million people find employment in our more than 1600 cotton mills. Almost all these mills are on the Atlantic slope, that is, between the Appalachian Highland and the Atlantic Ocean. In this general region two producing districts stand out: (1) Southern New England and (2) the Southern Piedmont (Fig. 164).

New England Textile Centers. In Southern New England textile mills are widely distributed, and in scores of villages a small textile

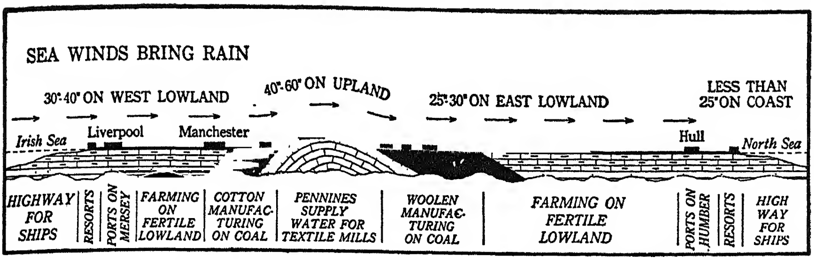

FIG. 163. Cross section of England from Liverpool to Hull, a distance of 125 miles

mill is a characteristic feature. Equally characteristic, however, is the fact that big mills in less than a dozen cities do most of the spinning and weaving (Fig. 165). The textile cities have other interests besides cotton, however, and in recent years the variety of their interests has increased; in fact, New England industry is characterized by wide variety.

Development of Cotton-Manufacturing in New England. Cotton-manufacturing in New England began in the first decade after 1800 and was one of the first of the major lines of manufacturing to become established in America. It grew out of opportunity and necessity. The opportunity lay in the market furnished by an expanding population in the United States. The necessity came when war in Europe made it impossible for American merchants to get British cotton goods. Out of attempts to supply the local market came the beginnings of cotton-manufacturing west of the Atlantic.

How machines were obtained. Transplanting an industry across an ocean is a considerable task even in the present era of well-developed transportation and communication. In 1800 it was a monumental undertaking. At that time no one in the United States knew how to run textile machines, even less to make them. The machines could not be brought from England, for the English refused to export them. The authorities even searched the baggage of people sailing from British ports to prevent plans of the machines from being carried to another country. At length, one Samuel Slater, an expert textile machinist, migrated to America. He built the machines from memory and started a tiny mill in Rhode Island. Other people also were experimenting, and after early trouble the industry got under way. Experience soon demonstrated that New England possessed the conditions essential for the new industry.

Capital and labor available in the area. Even in its early stages, cotton-manufacturing needed capital and labor: money to build factories and people to run the machinery. In part, at least, the capital came from profits made in the shipping industry, which had been and still was of much importance in New England. As the mills prospered, profits were reinvested in additional mills. Gradually the industry became one of the leading lines of American manufacturing. At the outset labor for the mills came largely from the New England farming districts. Later, French Canadians migrated in large numbers to the mill towns. In still later times New England factories drew upon the stream of European labor entering the United States through the port of New York. In this, as in other respects, nearness to the port of New York is an important asset of New England mills and factories.

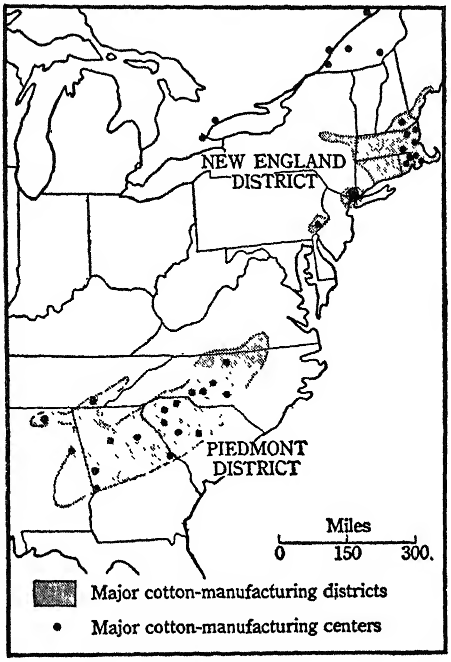

FIG. 164. Cotton-manufacturing centers and districts in the United States and Canada

Water power near the coast. The early cotton mills were built at sites where water power was available near the coast. New England streams are marked by rapids and falls, each of which is a potential power site. Most of these sites were too far inland to be accessible until railroads were built to them. In Southern New England, however, the Blackstone, Thames, and other small, short streams tumble down rocky steps to the sea (Fig. 165). Roads or canals had been built along these valleys, thus making the power sites available. At the outset, moreover, a site on a small stream was preferred, because it was a simpler task to dam a small stream. As the mills grew in size they outgrew the small power sites, and therefore big mills were built either at large power sites such as Lowell and Lawrence on the

Merrimack, or at coastal points to which coal was brought by sea, as at Fall River and New Bedford in the southern part of Massachusetts.

Present-Day Advantages. Textile manufacturing is today one of the outstanding industries of New England. Goods of great variety are produced, and New England cottons and woolens have won a country-wide reputation for their quality. In fact, as time goes on, the business of many New England mills has been retained by emphasizing quality rather than cheapness. Important assets today are the skill and experience of the people engaged in the industry and the proximity of the industry to Boston and New York, the leading centers from which textiles made in the United States are distributed to both domestic and foreign markets.

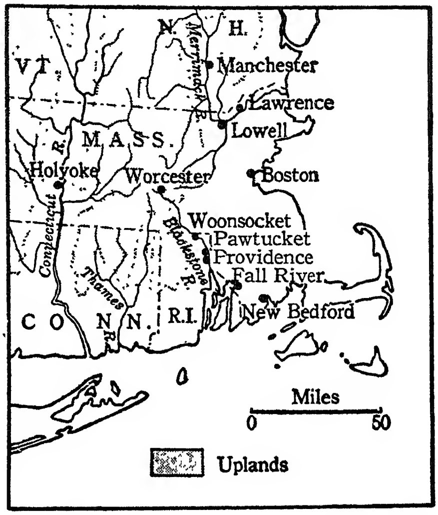

FIG. 165. Principal textile-manufacturing centers of New England

Cotton-Manufacturing in the Southern Piedmont. In the South cotton-manufacturing has developed on both flanks of the Southern Appalachian Mountains. The principal area lies east of the mountains in the Piedmont Belt of North and South Carolina and Georgia (Fig. 164). Within this belt a large number of cotton-milling communities are located along the main line of the Southern Railway. This line leads northward from Atlanta to Washington, D.C., through such important milling and railway centers as Greenville, Spartanburg, Gastonia, Charlotte, and Concord (Figs. 95 and 166). Other milling centers of first rank—Columbus, Macon, Augusta, and Columbia, for example—also are important railway centers and thus have connection north and south.

Raw cotton produced in the region. In the Southern Piedmont, cotton-raising and cotton-manufacturing go forward in the same vicinity. In some cases part of the raw cotton consumed by a mill may be hauled to its gins in the farmers' wagons, thus saving the cost of rail haul and storage. Although a local supply of raw material is a

recognized advantage for cotton-milling, the point should not be overemphasized. Some mills use a grade of cotton not grown locally or not grown there in sufficient quantities. Others combine local cotton with grades brought from elsewhere. Thus, some of the North Carolina mills buy cotton in Mississippi or Texas, in which case they must pay a freight rate as high or nearly as high as a New England mill.

A region of abundant labor. Ask a cotton-manufacturer of the South about the labor situation, and in most cases he will reply that it is satisfactory. By this he means that he can get reliable workers when he needs them. In some cases workmen are recruited from near-by Piedmont communities. In others they come from the mountain districts to the west. In such isolated places people can produce the necessities of life, but they have little opportunity to sell a surplus, even if they produce it. Many of them, therefore, welcome a job in a Piedmont mill. They move to the factories for the same reason that in the last half of the eighteenth century men moved from many parts of England to get jobs in the Manchester District, and that in the early part of the nineteenth century workmen flocked to the New England mill towns.

Low cost of living an advantage. Low cost of living contributes to the attractiveness of the Southern Piedmont for manufacturing enterprises. Winter is so short and mild (Figs. 72 and 158) that houses do not need as much heat or as thick foundations as in colder regions. Thus a comfortable house can be built and run at less cost. The family budget does not need to provide for such big expenditures for heavy winter clothing as in colder localities. Food is relatively cheap; for the mills are in the midst of an agricultural area, and the growing season is long. Although these conditions are offset to a degree by expenditures for sanitation, ice, and other things necessary for health and comfort during the long summer, it is claimed that employees can work for somewhat smaller wages and yet live as well as in the Northern manufacturing centers. It is claimed also that the cost of labor makes up more than 80 per cent of the total cost of operating a cotton mill. If this be the case it is evident that the labor question is of great importance to the cotton mills.

Superpower a regional asset. Textile mills and other enterprises in the Southern Piedmont enjoy the advantage of cheap electrical power. Electricity is especially well adapted to cotton-manufacturing.

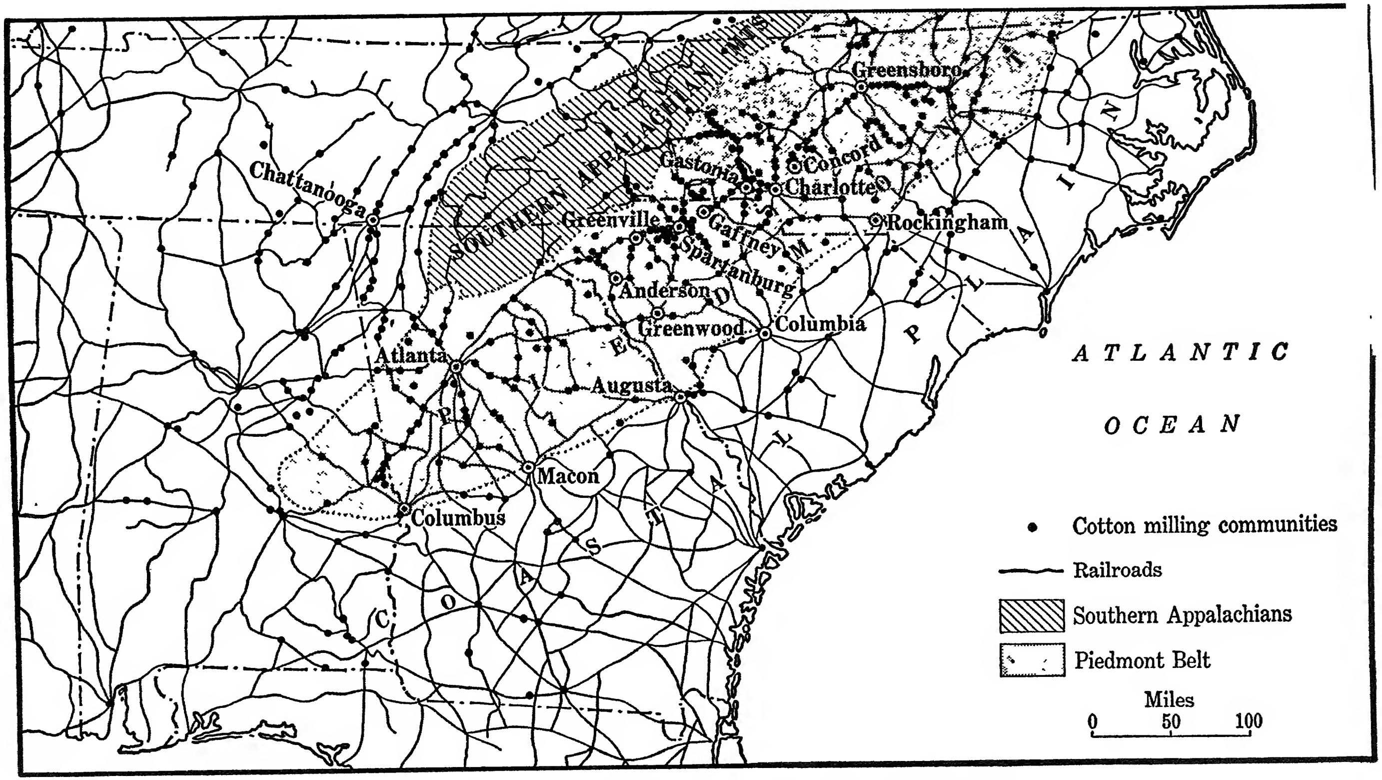

Fig. 166. Cotton-manufacturing communities of the South

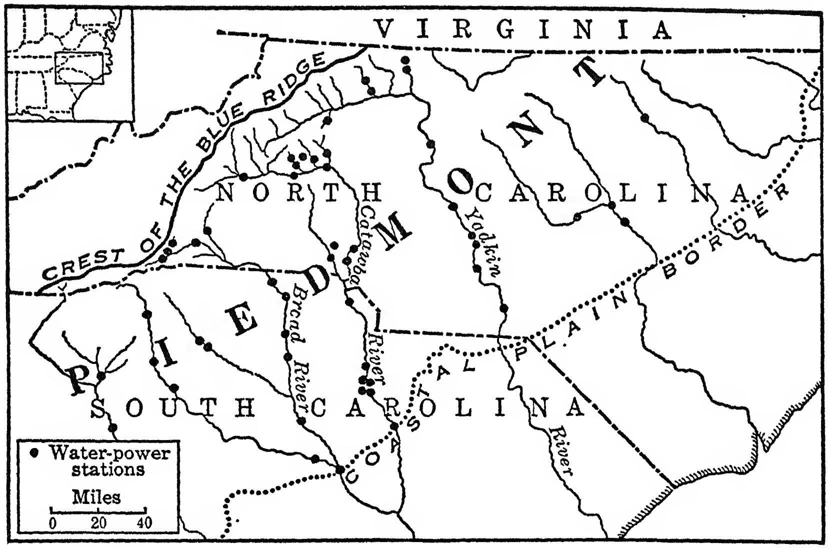

FIG. 167. Water-power stations supplying electric current to cotton mills and other industries in the Piedmont sections of North and South Carolina

By its use a single machine or group of machines may be run without operating the other machines. Therefore a manufacturer can operate all his machines when orders are plentiful or only part of them when business is dull. This is not the case in mills driven by steam power.

Most of the Southern cotton mills obtain their power on long-term lease from large power companies. These organizations supply power at relatively low rates; for water power is abundant, coal is relatively cheap, and operation is on a large scale. High-power transmission lines extend from their power plants to the mill villages and cities in the territory they serve. A single company owns or leases most of the power plants in North and South Carolina, another operates in Georgia, and still another in Alabama. The systems of these companies are interconnected, thus making the Southeast into a superpower area.

In generating electricity the power companies use both water power and coal. In order to develop water power, they have harnessed the Savannah, Broad, Catawba, Yadkin, and other rivers of the Southern Piedmont. These streams rise in the Blue Ridge and flow across the Piedmont and the Coastal Plain to the sea (Fig. 167). The power is developed in the Piedmont section, where the streams

flow in narrow V-shaped valleys cut in the granite floor of the region and where numerous rapids and waterfalls provide natural power sites. The supply of power is fairly regular throughout the year, for the rainfall is about equally distributed from month to month (see Fayetteville, North Carolina, in Fig. 158). Some power generated from coal is used to supplement the power from the streams. The coal comes mainly from the Virginia and West Virginia fields.

Market relations—the expanding South. Most of the cotton goods produced in the Piedmont area are distributed through New York City. This is due in part to the importance of New York as a distributing center and in part to the fact that the goods are finished in plants near New York. In recent years a number of bleaching, dyeing, and finishing plants have been built in the Southern textile areas. Previously it was thought that the quality of the water made this impracticable. This handicap has been overcome by filtering and softening the water. Finished goods in increasing amounts are therefore being produced in the South. These may be sold through Atlanta or other Southern commercial centers, and the rapid growth of Southern industries and Southern cities means an ever-expanding market in the South.

QUESTIONS

A. *The Cotton Belt and the cotton crop*

1. Where is the Cotton Belt (Fig. 156)?

2. Why are some parts of this belt not well suited to the growing of cotton?

3. Why do farmers in the Cotton Belt raise more cotton than anything else?

4. Which southern state is not in the Cotton Belt?

5. Why is cotton not grown farther north? Why not farther west? Why not south to the coast? Why does not the Cotton Belt extend into northwestern Arkansas? into northern Georgia?

6. What is meant by a one-crop system?

7. Which of the three major producing areas is best served by Galveston-Houston? by New Orleans? by Savannah? Why? (Fig. 156 and Plate II.)

8. In what month do planters of the South generally plant cotton? What is the average temperature of that month at Montgomery (Fig. 158)? In what month does the temperature in the Corn Belt average that high? (See Mount Vernon, Fig. 128.) What do these facts suggest about the migration of spring?

9. Do farmers near Fayetteville, N. C., probably plant cotton earlier, later, or at about the same time as those near Fort Worth (Fig. 158)?

B. *Cotton-manufacturing*

1. What are nine manufacturing operations involved in the story of a bale of cotton from the time it arrives at the cotton mill in North Carolina until it is sold as cotton cloth in New York City?

2. Which of the conditions favoring the development of cotton-manufacturing in the Manchester District hold true also in New England? Which in the Southern Piedmont?

3. Describe and explain the distribution of cotton-milling communities in North Carolina.

4. Compare the rainfall on the Pennine Range of England with that on (1) the west lowland and (2) the east lowland (Fig. 163). Explain. What bearing has this distribution of moisture on cotton-manufacturing?

5. What is the relation of the Pennine Range to the coal fields of Central England (Fig. 163)? What is the relation of coal to the localization of (1) cotton-manufacturing and (2) woolen-manufacturing in England?

6. In which part or parts of the following countries is cotton-manufacturing localized: France, Germany, Italy (Fig. 155 and Plate V)? Is cotton-manufacturing more important in Belgium or in the Netherlands?

7. What New England streams have been closely associated with the textile industry (Fig. 165)? Why?

8. Of what significance is the main line of the Southern Railway in cotton-manufacturing in the South? State the significance of this line in the railway pattern of Eastern United States (Fig. 95 and page 283). Why is Atlanta a great railway center (Plates II and III, Fig. 166, and page 176)?

EXERCISES

1. *Principal cotton-producing countries*

Consult the most recent Yearbook of the Department of Agriculture in your library for the cotton crop of the principal countries growing that crop. Make a graph to show the relative production in the five leading countries. Use graph paper or else let a sketch of a bale stand for 500,000 bales.

2. *Principal cotton-growing states*

Make a similar graph for the 8 states which lead in cotton production. Can you use the same scale as for the graph representing countries?

3. *Ocean trade in raw cotton*

Show in color on an outline map of the world the principal cotton-growing areas shown in Figure 154. Add lines to the map to show paths which you think are followed by many ships carrying cotton to manufacturing regions.

CHAPTER XIX

THE TOBACCO INDUSTRY

Three Centuries of Tobacco. Tobacco is the oldest commercial crop of the United States and has figured in our history since the time of the first permanent settlement. The Indians used tobacco in various ways and European explorers carried small quantities of it home with them. In time the new product came into favor in Western Europe. This created a market, and tobacco was raised commercially by the Spanish settlers in the West Indies, Central America, and South America. Later it became the first export of the Virginia colony. Jamestown shipped 20,000 pounds to England in 1618; and in the years before the Revolutionary War the exports amounted to 100 million pounds a year, a mark not reached regularly again until 1835. Since then both the exports and the domestic use have grown until today tobacco is second only to cotton in value among our agricultural exports.

The demand for tobacco is so great that tobacco is almost as good as gold. It has value everywhere. Taxes on tobacco produce more income for the United States government than any other source of revenue except the Federal income tax and the customs collected from our imports. The tobacco crop is highly important not only as a cash crop to the farmers who raise it but also to the dealers who buy and sell the leaf. In addition the manufacturers who turn out the cigarettes, cigars, and other tobacco products have found the manufacture of such products a highly profitable business.

World Production. Tobacco culture did not remain exclusively in its native America. Western Europe tried it with success, and now most countries of Europe and Asia produce tobacco commercially. The United States, however, always has been the leading producer, with more than a fourth of the world's total in recent years. India ranks next below the United States in quantity of production, with the Soviet Union, Brazil, the Philippine Islands, Greece, Turkey, Cuba, and Java among the other producing areas. China undoubtedly has a big crop, but its total production is unknown.

The world's tobacco is grown under widely different climatic and soil conditions. Though many countries grow tobacco, only a few possess the combination of soil and climate necessary for producing high-grade leaf. Even in the countries where the quality is high and

the production large, the actual growing areas are small. In the United States, for example, our tobacco crop requires only two million acres of land, whereas barley requires six times and cotton twenty-five times that amount.

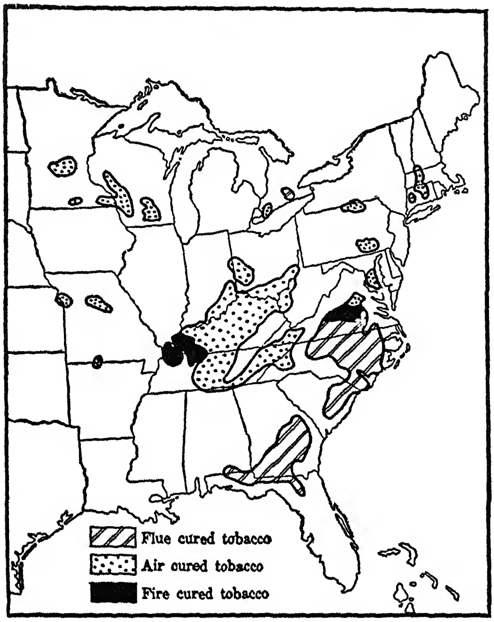

FIG. 168. Major tobacco-producing districts of the United States

Producing Districts in the United States. Tobacco is grown in numerous sections of Eastern United States, but the major producing districts lie in a belt made up of four states—North Carolina, Virginia, Kentucky, and Tennessee—and small parts of neighboring states (Fig. 168). This belt occupies a middle position in the eastern part of the country and produces types of tobacco which are manufactured into cigarettes, smoking and chewing tobacco, and snuff. The small northern districts and some of the small districts of Florida and Georgia produce cigar types of tobacco.

Growing the Crop. Tobacco takes all year to grow and market; in fact, in January a farmer may be selling the end of his last season's crop. Like the cotton crop, tobacco calls for months of work before there is anything to sell, and thus most growers run into debt for food and supplies during the long waiting period. Tobacco calls for such continuous attention that commonly the tobacco farmer does not spend much time in growing food crops for his family or other cash crops. For this reason a good crop and a good price mean prosperity in the villages and cities as well as on the farms of the tobacco-producing regions, whereas a poor crop and price mean the opposite.

Methods of growing and curing the tobacco crop vary with the type of tobacco and with local conditions. In all areas, however, the crop passes through four distinct periods—namely, the plant-bed

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FIG. 169. A tobacco seedbed and a field in the background ready for setting

period, the transplanting period, the cultivation period, and the harvesting and curing period. These periods roughly follow the seasons, the plant bed in winter, the transplanting in spring, the cultivating in summer, and the harvesting in autumn. Let us follow the crop from season to season in North Carolina, the leading tobacco state.

The Plant-Bed Period. Tobacco begins its growth in a seedbed and then is transplanted to the fields. The young plants are very tender and are likely to be damaged by the weather or by insects and other pests. To guard against these hazards, the seeds are planted in a specially prepared seedbed, generally in January or February (Fig. 169). Every effort is made to control conditions in the seedbed. In the Piedmont section the farmer clears a spot in his forest far from the weeds and the pests which infest the cultivated fields. As the North Carolina winter is not cold enough to kill off all insects, the farmer piles wood and brush all over his plot and burns it. This leaves the soil free from both weeds and insect pests. In the newer section of the coastal plain this practice is not always followed; but care is taken to place the bed on a southerly or southeasterly slope where it will get the most sunshine and, if possible, where a belt of trees will protect it from westerly and northerly winds. If the bed is

near a stream, so much the better, for then the farmer can water it if the weather turns dry. A loamy type of soil is preferred, and the soil should drain quickly so that the crop will not be damaged in case of prolonged wet weather.

After the bed is carefully prepared and fertilizer added, the tiny tobacco seeds are planted. Commonly a cover of cheesecloth is stretched over the bed to protect it in cold and damp weather. In about three weeks the tiny plants appear, and the farmer watches them carefully to detect the first signs of damage by insects or disease. On sunny days the cover is removed to let in as much sun as possible, and is replaced at night. If the weather is bad or the plants are destroyed, the farmer may have to buy his plants in some distant area where conditions have been better.

The Transplanting Period. About the first of May, when the danger from frost is past, the plants are transplanted from the plant beds to the fields. In order to prepare the land for the crop, the fields may have been disked in the previous autumn and sown to rye. In the early spring this growth is turned under and the soil is worked until it is ready for the tiny plants. Then the rows are fertilized and the plants are set at regular intervals. Each plant is watered as it is set out. On the larger farms planting is done with a machine, but some farmers do not have a crop big enough to warrant this expense (Fig. 170). After a few days any dead or sickly plants are replaced, and poison to kill bugs and worms is applied.

The Cultivating Period. In about ten days cultivation begins. A light cultivator is run close to the plants to remove weeds and to throw the soil away from the row. Then farm hands chop out between the plants and draw up dirt around each plant. Every ten days this work is repeated until the land has been worked three or more times. Even with all this care the success of the crop depends upon the weather and the degree of damage done by pests. In the principal tobacco districts the summer weather is fairly reliable, much more so than in the Connecticut Valley and Wisconsin, where hail, winds, and cool, damp weather injure the crop in some seasons.

Topping follows cultivation. The tobacco plant buds early, and the buds must be pinched off by hand or the plant will go to seed and not fully develop its leaves. The plants, however, grow suckers where the top has been removed. These suckers and others that follow them must be removed if the leaves are to attain perfect growth.

FIG. 170. Planting tobacco with a machine

The Harvesting Period. At maturity the tobacco plant stands from three to four feet high, with its broad leaves big enough to shade the ground. Harvesting begins about ten weeks after transplanting. This means August in North Carolina. In some tobacco areas the whole plant is cut with a knife, but in North Carolina "priming" is the method used; that is, the fully ripened leaves are stripped off by hand, the unripened leaves being left to ripen. One man strips the leaves from two rows at a time and passes them to another man, who places them in a burlap bin on a sled. When the sled is loaded, it is driven to the barn, where other farm hands—in some cases the women of the family—tie the leaves to sticks and then hang them across poles in the barn to be cured over the heat of the flues when the barn is full.

Curing Tobacco. Curing prepares the tobacco leaf for market. The method of curing varies from area to area and with the type of tobacco grown. This means that the type of tobacco, the method of curing, and the quality of the leaf all play a part in classifying the leaf into grades in the tobacco markets. Three methods of curing are in common use: flue-curing, air-curing, and fire-curing.

Flue-Cured Tobacco. Flue-cured tobacco comes mainly from North Carolina and Virginia, but it also is produced in South Carolina, Georgia, Florida, and in small areas in Canada (Fig. 168). This type of tobacco goes mainly into the manufacture of cigarettes, smoking tobacco, and chewing tobacco. The major territory producing this type is divided into the "old belt," on the piedmont of North Carolina

and Virginia, and the "new belt," on the coastal plain of the same states. The leaf from the old belt is heavier in body and darker in color than that from the new belt. The crop of the new belt matures earlier because that belt has a warm sandy-loam soil, lies at lower elevations, and, on the whole, is farther south. As a result, harvest commonly is finished on the coastal plain before it begins in the piedmont area.

Flue-curing calls for great skill and experience. Flue wood, cut during the previous winter, is at hand and is fed to the furnace from openings in the side of the barn. The furnaces are built of brick or field stone, and the heat passes along the floor of the barn through iron flues about 14 inches in diameter. The heat removes the moisture from the leaves and ferments the starches into sugar. Low heat is wanted at first, the temperature being raised as curing proceeds. The man in charge must watch the heat carefully day and night, opening or closing the door or stoking his fire with every change of the weather, adapting it also to the heat of the day and the cool of the night. After about four days the curing is finished, and the tobacco is taken to a packing house to be packed and kept until the farmer is ready to sell it. Other primings come from the fields, and the average farm must have five or six barns to care for these. Clusters of these barns, about 18 feet square and taller than they are wide, form conspicuous features in the rural scene of the flue-cured tobacco districts.

Air-Cured Tobacco. Air-curing, the other important curing method, is practiced in the big western district in Kentucky and in neighboring sections of Tennessee, Indiana, and Ohio. It also is the method used in the small northern districts. Kentucky produces the famous Burley and other light-colored varieties which, like flue-cured tobacco, are used for cigarettes, smoking mixtures, and chewing tobacco. There the plants are cut and hung in barns which, since air-curing takes weeks instead of days, are much bigger than those of the flue-cured districts. In order that air may circulate freely about the drying tobacco, the barns are equipped with a number of side-wall boards set on hinges or with several high, narrow doors which can be opened in fair weather (Fig. 171).

All types of cigar tobacco are air-cured, and most of the cigar leaf comes from the small northern districts. Different kinds of tobacco are used in the core, the body, and the wrapper of the cigar. In the Connecticut Valley the tobacco for the wrapper is grown under

a cover of cheesecloth, which shades the plants throughout their growth, and the delicate, silky leaf from these shaded fields brings higher prices than any other American tobacco. Pennsylvania produces more than half the cigar-filler tobacco of the country; in fact, in some years Lancaster County, in the eastern part of the state, has been the leading tobacco county of the United States. Both Connecticut Valley growers and those of Pennsylvania find a near-by market for their crop in the important cigar-manufacturing centers of Philadelphia and New York. The Miami Valley section of Ohio is the only important producer of filler-type tobacco outside Pennsylvania, and the industry of this district centers about Dayton. Wisconsin tobacco is used mainly for cigar-binder, the sheet of tobacco just inside the wrapper. Like those of the Connecticut Valley, Wisconsin growers get a larger yield per acre than is common in the principal tobacco districts farther south. Wisconsin leaf, however, brings low prices.

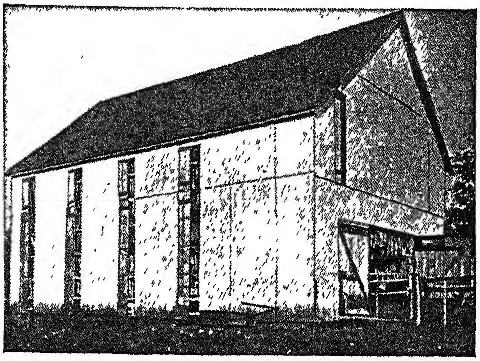
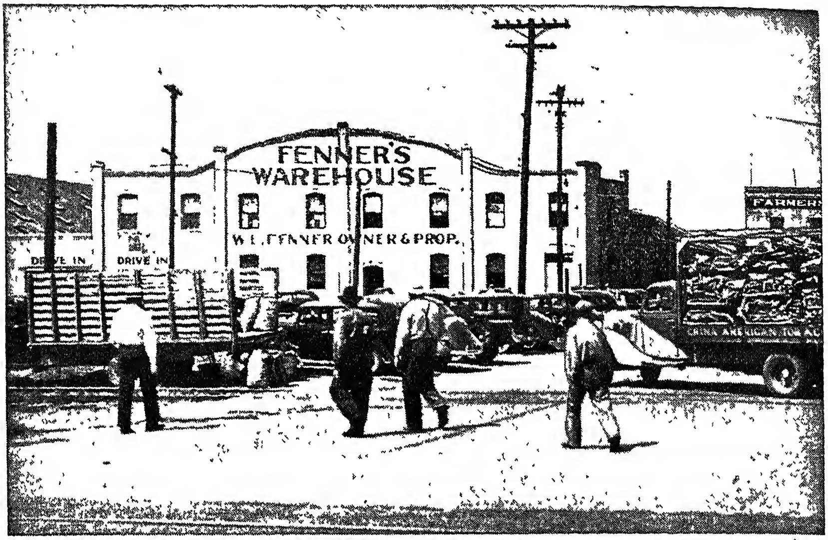


FIG. 171. A barn for the air-curing of tobacco

Fire-Cured Tobacco. Fire-cured tobacco is much less important than either the flue-cured or the air-cured type. It is produced mainly in a section of Virginia and in small sections of western Kentucky and Tennessee. In the United States it is used largely for making snuff, but it is exported for use in smoking mixtures. The practice of fire-curing grew out of the necessity for protecting the tobacco during damp weather. The plants are cut within a few inches of the ground, and after lying in the fields long enough for the leaves to wilt they are hung on poles in the barns. Slow fires are built on the floor of the barn, and by great care through a period of from one to three weeks the tobacco is cured and made ready for market.

Marketing Tobacco. Tobacco is sold through market towns spaced at convenient distances in the tobacco-growing areas. These markets open for business toward the end of the curing season, commonly opening earlier in the southern districts. In North Carolina and Ken-



Acme

FIG. 172. A tobacco warehouse in Rocky Mount, the oldest tobacco market in North Carolina

tucky they open in September, the exact time varying with the season and the locality. Tobacco is sold in huge auction warehouses which, because of their low roofs studded with skylights and their great size, are conspicuous features in the market towns (Fig. 172). Within the warehouses, driveways along the sides give ready access to the spacious floor, where tobacco brought in by the farmers is displayed in baskets or trays. The tobacco is auctioned off, the bidders being dealers, speculators, exporters, and buyers for the great tobacco-manufacturing companies. This marketing system calls for a great outlay of capital because the farmers are paid at once and large numbers of people are paid during the long market season from August to April.

In the warehouses, as in the barns and packing houses, the condition of the tobacco leaf varies with the weather. In dry weather it becomes brittle and breaks up with handling. Humid weather, which makes it soft and pliable, is known as "tobacco weather." Buyers have to allow for these changes, and thus experienced buyers are much in demand. Even in tobacco-manufacturing the weather affects the leaf, and therefore some of the factories are air-conditioned in order to control temperature and moisture.

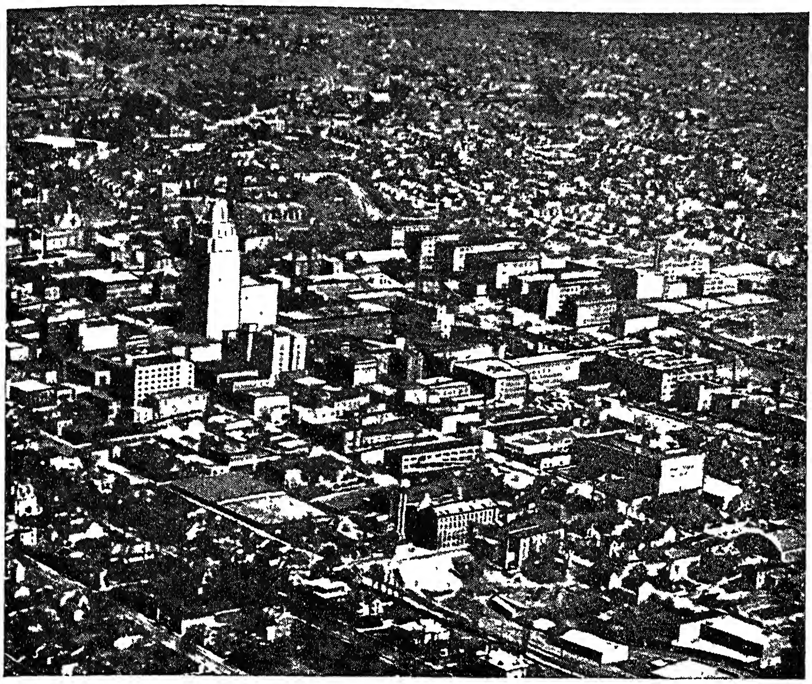


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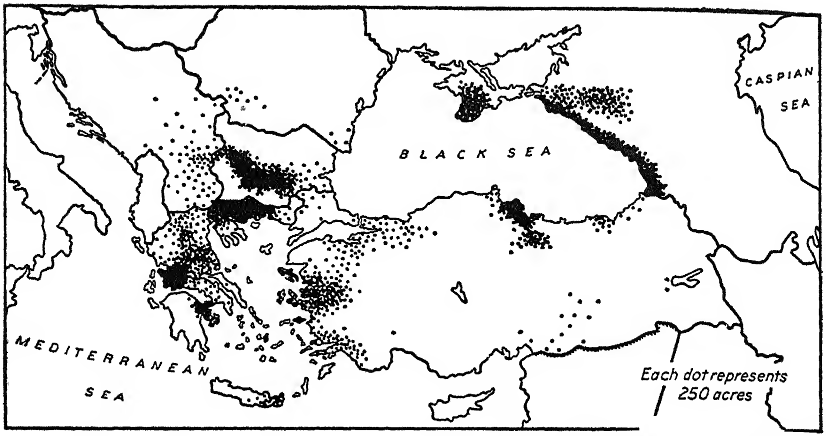
FIG. 173. Air view of part of Winston-Salem. At the right of the center of the picture are some of the buildings of one of the large tobacco companies

Tobacco-Manufacturing. Tobacco-manufacturing began long ago on the farms, where small amounts were prepared for sale, and in the villages, where cigars were made as a sort of family enterprise. Gradually the manufacture changed to a factory basis. Now most cigarettes, smoking tobacco, and even cigars are manufactured in large establishments owned by a few great companies. The greatest product at present is the cigarette, which has come into enormous popularity since the World War. The leading companies had their origin long ago in North Carolina, Virginia, or Kentucky, and today these states lead in tobacco-manufacturing. They have the advantages of a local supply of the right kind of tobacco, cheap coal or hydroelectric power, an abundant supply of experienced labor, and desirable living conditions.

The leading tobacco-manufacturing centers are Winston-Salem and Durham in North Carolina, Richmond in Virginia, and Louisville in Kentucky (Fig. 173). One North Carolina company com-



U. S. Department of Agriculture

FIG. 174. Tobacco production in the Eastern Mediterranean-Black Sea areas

monly employs about 13,000 people and occupies 54 factories and other buildings. One of its factories turns out nothing but tin foil for wrapping tobacco products, and another makes wooden boxes for shipping products to foreign countries. About three miles from Winston-Salem, the city in which it is located, the company has row after row of long low buildings to store both domestic and imported tobacco. Some of this tobacco comes from Greece and Turkey; for in making cigarettes small quantities of aromatic, highly flavored foreign tobacco are blended with the domestic product (Fig. 174). The company also maintains in many of the market centers leaf-storage warehouses where tobacco ages and mellows before being shipped to the factory warehouses.

Cigar-manufacturing is widely distributed; but Pennsylvania, New Jersey, and New York in the North, and Florida in the South, lead in this branch of the tobacco industry. The first three states named are near the densely peopled urban areas where many cigars are smoked, whereas Florida is close to Cuba, from which come grades of tobacco much prized in making cigars. In former years cigars were made in a great number of small shops, but the present trend is toward large factories.

International Trade in Tobacco. The United States is the leading country in tobacco exports, and the United Kingdom and Germany lead in imports. The North Atlantic Route thus figures prominently in this phase of international trade, just as it does in the oversea

trade in wheat, cotton, lard, and apples. Greece and Turkey in the Mediterranean area (Fig. 174), Netherlands Indies and the Philippine Islands in the Orient, and Brazil in South America are the other important exporting countries. Nearly all countries import some tobacco, as its use is now common in practically all parts of the Commercial World. The United States imports as well as exports; for, as has been stated, the American tobacco companies bring in special types from Greece, Turkey, Cuba, and other countries to mix with our domestic tobacco.

QUESTIONS

1. Of what importance was tobacco to the early settlements in Virginia?

2. What is the significance of tobacco to the United States government at the present time?

3. Compare the size of the tobacco fields on an average tobacco farm with the grainfields on an average grain farm. Explain.

4. Why does the crop of one tobacco section vary in quality from that of other sections?

5. State the distribution of the three types of tobacco districts.

6. Why is the average tobacco farm a single-crop farm? How does this practice affect the income of the tobacco farmer from year to year?

7. What expense have the farmers in the flue-cured tobacco areas which the farmers in the air-cured tobacco districts do not have?

EXERCISES

1. *Weather and tobacco*

Write a brief essay on the relation of weather to the production, marketing, and manufacturing of tobacco.

2. *Selling tobacco*

Many stores in which cigars, cigarettes, and other tobacco products are sold are located on street corners. Why? Name the different types of stores that sell tobacco in the community where you live.

CHAPTER XX

COAL

1. *Coal in the World's Work*

The Coal Traffic. The traffic in coal exceeds that of any other commodity either on sea or on land. Coal fills more ships and more freight cars than any other commodity. Every day of the year huge quantities of coal are hauled away from the mining districts of the United States, and coal makes up approximately a third of the freight traffic on our railroads. The consumption of coal is greatest in the northeastern quarter of the country, where a dense population, a closely spaced railway net, much manufacturing, and long, cold winters combine to create a big demand. It is least in the southwest, where the population is less dense, the locomotives burn oil instead of coal, little manufacturing is done, and the winters are mild.

Coal as a Railway Fuel. Although oil is used in firing locomotives in some areas, railway transportation depends largely upon coal for fuel. In a broad and productive country such as the United States, long, heavy trains are hauled great distances, and in some parts of the country the number of passenger and freight trains is large. In fact, the locomotives on our more than 250,000 miles of railways burn approximately a fifth of the output of our coal mines.

Coal as a Source of Power for Manufacturing. The tall chimneys of our factory districts proclaim the importance of coal in industry. Power-driven machinery increases human output enormously. In many cases coal supplies the power, and in such cases a manufactured article represents a certain amount of coal. In a modern building, for example, every ton of the steel represents two tons of coal, and a ton of the cement costs half its weight in fuel. The paper in this book required for its manufacture more than twice its weight in coal.

Coal represents an important item in the operating costs of manufacturing establishments, particularly those requiring heat as well as power. The steel, cement, brick, tile, foundry, and refining industries belong to this class and consequently require much coal. The manufacture of watches, shoes, or electrical apparatus, in contrast, takes relatively little coal. As the cost of coal increases with distance from the mines, a location near a coal field is an asset for plants requiring much coal. The steel mills of Pittsburgh and Birmingham

and the factories of East St. Louis are examples of plants located almost within sight of coal mines.

Coal as a Raw Material. Coal enters industry not only as a source of heat and power but also as a raw material for manufacture. Coke and gas are the most important products made from coal, but there are many others. Coke is made by baking high-grade soft coal in an oven. The heat drives off gas and leaves the hard, porous gray coke. Each ton of coal yields approximately 75 per cent of its weight in coke and also produces gas, coal tar, ammonium sulphate, benzol, and other products. In many instances the by-products are as valuable as the coke. Some coke is used for domestic fuel, but its major use is in the manufacture of iron and steel; in fact, most steel plants now include by-product coke ovens as part of their equipment. At present coke ovens take 14 per cent of the coal consumed in this country.

Coal in the Home. The family coal bill varies greatly in different parts of the country. It is largest in the northern section, where heat is needed in the homes from October to May. In general, it decreases from north to south and is least in Florida, the Gulf Coast, and Southern California. The total amount of coal burned for domestic purposes is very large; in fact, the coal consumed in our homes and factories makes up nearly 55 per cent of all the coal used in this country.

In addition to heating our homes, coal makes possible many conveniences and services. In many places electric lights, washing machines, fans, and cleaning apparatus are run by current generated from coal. Gas for cooking comes largely from coal, water is pumped by coal-driven engines, and ice is made through the use of coal. So indispensable are these services that they are recognized as public utilities, that is, services essential to the general health and welfare. Of the coal consumed in this country, the electric public utilities alone account for 10 per cent.

Coal in Our Foreign Trade. The amount of coal exported from the United States is small when compared with our domestic consumption. Our principal export is to Canada, and this coal constitutes in weight the largest item of our export trade. We also import small quantities of coal from Canada. This exchange of a heavy, bulky commodity appears to be a wasteful performance, but in reality it is sound trade practice. Our coal lies in the interior (Fig. 175),

whereas Canada has important deposits at both her Atlantic and Pacific doorways. Our exports to Canada are mainly short-distance shipments across the border into Ontario from mines in Pennsylvania and Ohio. Our imports of coal from Canada are brought into the country chiefly by sea. The Pacific Northwest gets coal from mines on the east side of Vancouver Island, and in the East a small amount of coal is brought to New England points from mines in Nova Scotia.

Our exports of coal by sea are much less than those of Great Britain. Our coal lies away from the seaboard (Fig. 175), and coal exported by sea from this country must pay freight charges to the seaboard as well as the cost of an ocean haul. On the other hand, some of the British mines are at or near the seaboard, and the coal is loaded into ships directly from the mines or, at least, with only a short rail haul. British exports, moreover, are stimulated by near-by markets in Denmark, the Netherlands, and other seaboard areas which use much coal but do not produce it and by sales of British coal at the coaling stations along ocean routes.

2. *Coal Production and Coal Fields in the United States*

Coal-Producing Fields. Although some coal is mined in thirty-one states, nearly 90 per cent of the total production comes from five producing districts (Fig. 175). Three of these fields lie in the Appalachian Highland, the fourth in Illinois and Indiana, and the fifth in the Rocky Mountains. Another small but famous field, the Anthracite Field of northeastern Pennsylvania, is in a class by itself, as its output of anthracite, or hard, coal is used mainly for domestic purposes.

The Northern Appalachian Field. Bituminous, or soft, coal underlies much of the western third of Pennsylvania and much of Eastern Ohio. This area contains five of the leading eight coal-producing counties of the United States (Fig. 175). This great coal field has attracted so many manufacturing concerns that the Pittsburgh District is thought to consume more coal than any other area of similar size in the world. The city lies at the junction of the Allegheny and Monongahela rivers, and the combined valleys of these two streams roughly bisect the coal field from north to south. The field is bisected also by the main line of the Pennsylvania Railroad from east to west and by the main line of the Baltimore and Ohio from southeast to

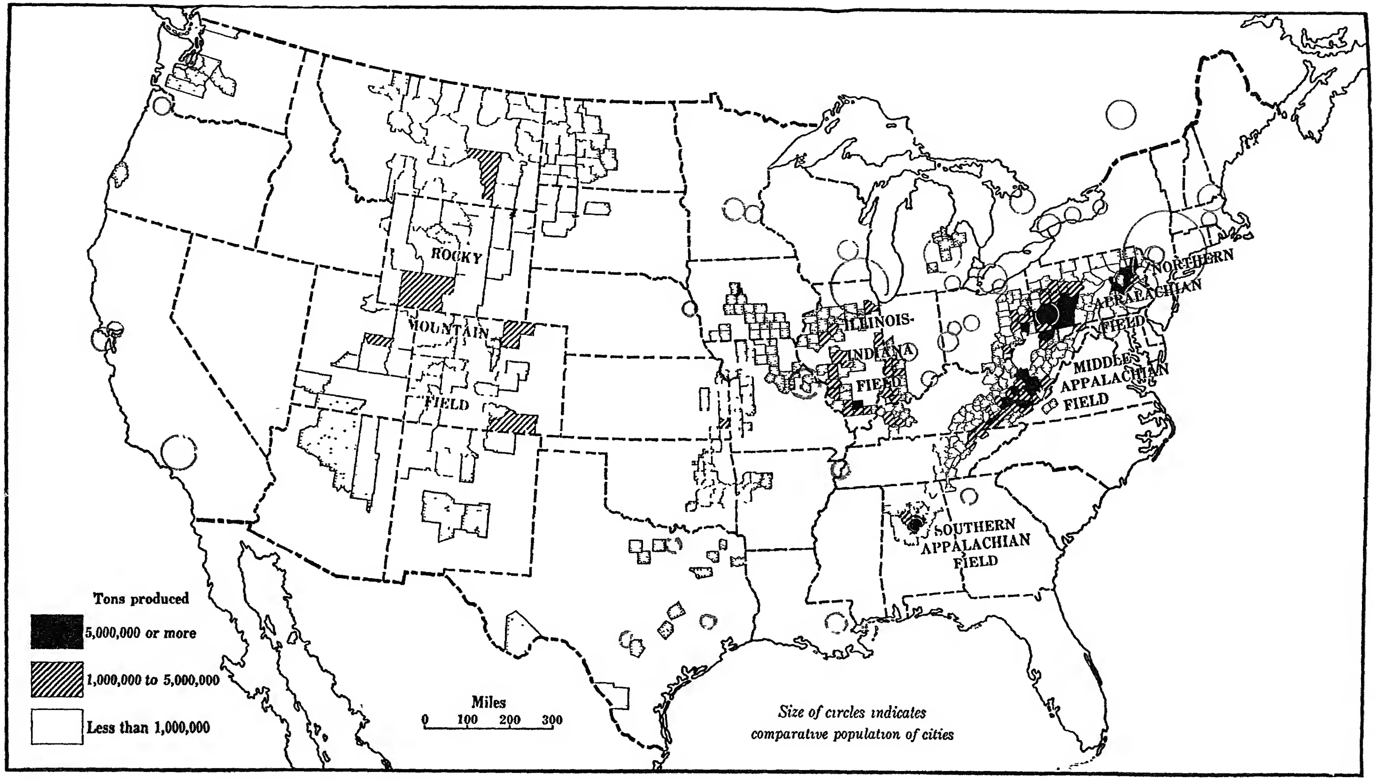


FIG. 175. Coal-producing counties of the United States. (Circles show cities with a population of 200,000 or more)

northwest. All these transportation routes focus on Pittsburgh, making it the logical business center of the area and giving it excellent facilities for securing coal from the mines (Fig. 95 and Plate III).

Coal seams and the Allegheny Plateau. In the Northern Appalachian Field, coal occurs in a number of seams, or beds, separated by layers of rock. In digging a shaft, therefore, seams of coal are encountered at successive depths. These seams may range in thickness from less than an inch to ten feet or more. Where more than one seam is thick enough to be worked profitably, coal may be mined at different depths in the same mine.

The alternate layers of rock and coal betray the origin of the coal. Countless ages ago thick masses of vegetation accumulated in shallow fresh-water bodies or in low swampy tracts. At some later time these accumulations of vegetation were covered with thick deposits of sand or mud brought from higher land by streams. Each process took long periods of time; and the processes were repeated until the beds of sand or mud, with thinner beds of vegetation, were hundreds of feet in thickness. The whole structure then resembled a layer cake,—a gigantic cake hundreds of feet in thickness and spread over many square miles,—with the beds of sand or mud as the cake and the filling made up of the beds of vegetation. In time the beds of sand and mud were cemented into solid rock and the vegetation was changed to coal.

As time went on the area containing the seams of coal was uplifted to an elevation about 1500 feet above the sea. This uplifted area, the cake of our figure of speech, is the Allegheny Plateau, which occupies the western third of Pennsylvania and neighboring sections of Ohio and West Virginia. Streams have cut deep valleys into the plateau until now it is hilly country, with the valleys occupied by streams, and the streams separated by ridges. In some places the streams have cut deep enough to expose seams of coal along their slopes; in others the seams must be reached by sinking shafts from the floor of a valley.

Quantity and quality of the coal. The Northern Appalachian Field is remarkable for both the quantity and quality of its coal. Although a number of seams are worked, the production and the reputation of the district depend largely upon the Pittsburgh Seam (Fig. 176). This seam occupies an area about 50 miles long by 50 miles wide in Pennsylvania, and it also extends into northwestern West Virginia

and southeastern Ohio. It varies in thickness from 4 to 9 feet, with an average thickness of 7 feet (Fig. 177). Originally the seam contained about 10 billion tons of coal, and from it, in Pennsylvania alone, is produced about a fifth of the coal mined in the United States. In the production of coke the Pittsburgh coal is not excelled by any other coal mined in the United States.

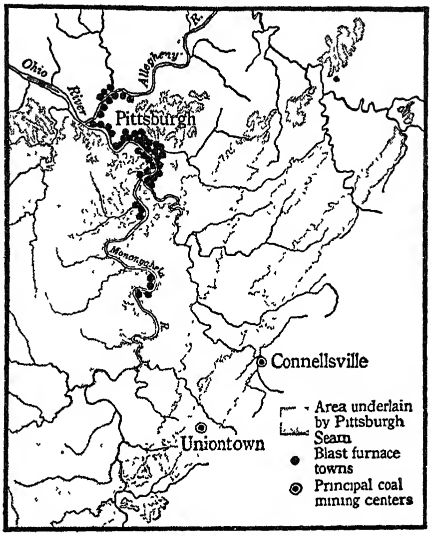


Fig. 176. The Pittsburgh Seam in Pennsylvania

Mining favored by natural conditions. Mining coal in the Northern Appalachian Field is relatively simple. The coal beds and the rocks in which they occur lie practically horizontal. The seams are continuous over large areas and lie only from 200 to 1000 feet below the surface. They are thick enough and the quality of the coal is good enough to permit the profitable use of mining machinery. However, 80 per cent of the bituminous coal produced in the United States is mined with machines. The rocks which overlie the beds (the overburden, as the miners call it) are in most places firm enough to support the timbers put in to hold up the roof.

Advantages in marketing Northern Appalachian coal. No other American coal field is so well placed for marketing coal as the Northern Appalachian Field. In the first place, the mills and factories of the Pittsburgh District furnish a big local market. In the second place, the field lies between the cities of the Eastern Seaboard and those of the Middle West (Fig. 175). At no great distance on the east, north, and west the field is encircled by large cities, all of which require great quantities of coal (Fig. 178).

The Middle Appalachian Field. The Middle Appalachian Field is second only to the Northern Appalachian Field in production, its coal (bituminous) is of equal quality, and it is part of the same plateau region. The middle district, however, is more deeply cut by

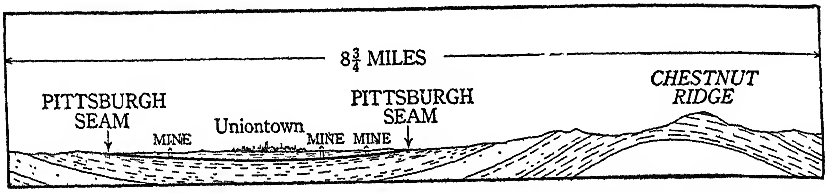


Fig. 177. Cross section of the beds containing the Pittsburgh Seam at Uniontown, Pennsylvania

streams than the northern, and these streams have cut the surface into a maze of roof-shaped ridges and V-shaped valleys (Fig. 179). The most famous coal of the Middle Appalachian Field is the Pocahontas coal, which, because of its smokeless character and heat-producing qualities, is much prized as fuel for ships. The principal mines are in the southern part of West Virginia and the eastern part of Kentucky. In the Big Sandy area of Eastern Kentucky, thick seams of fine coal outcrop along the walls of the valleys. As a result, mining operations are reduced to the simple matter of driving tunnels into the seams and dropping coal from the mouth of the tunnels down chutes and into coal cars. Some of the mining companies own large tracts of land, and knowing that their land contains enough coal to last for many years they have built modern mines and mining towns (Fig. 179). Natural advantages and large-scale management enable these companies to produce coal at surprisingly low cost.

The Middle Appalachian Field sits astride the Appalachian Highland. Coal is shipped eastward to tidewater at Norfolk and Newport News and to other points in Virginia and the Carolinas. It moves in even greater quantities northward and westward to points north of the Ohio River. The principal railroads crossing the field are the Chesapeake and Ohio, the Norfolk and Western, and the Virginian. Coal normally forms more than 75 per cent of the traffic carried by these lines, and the Chesapeake and Ohio carries more coal than any other American railroad.

The Southern Appalachian Field. The Southern Appalachian Field lies at the extreme southern end of the Appalachian Highland. Production centers about Birmingham in Alabama, but it extends northward into Tennessee. Most of the coal beds are tilted somewhat from their original horizontal position, and much of the mining is done by "drifts" down the slope of the beds. In some places coal lies

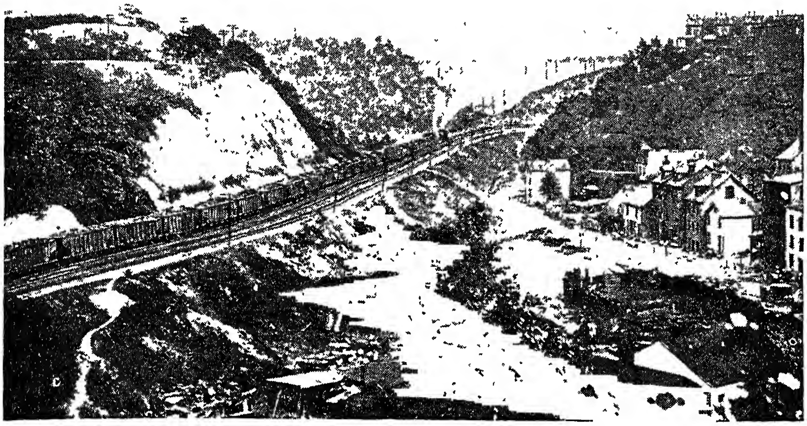
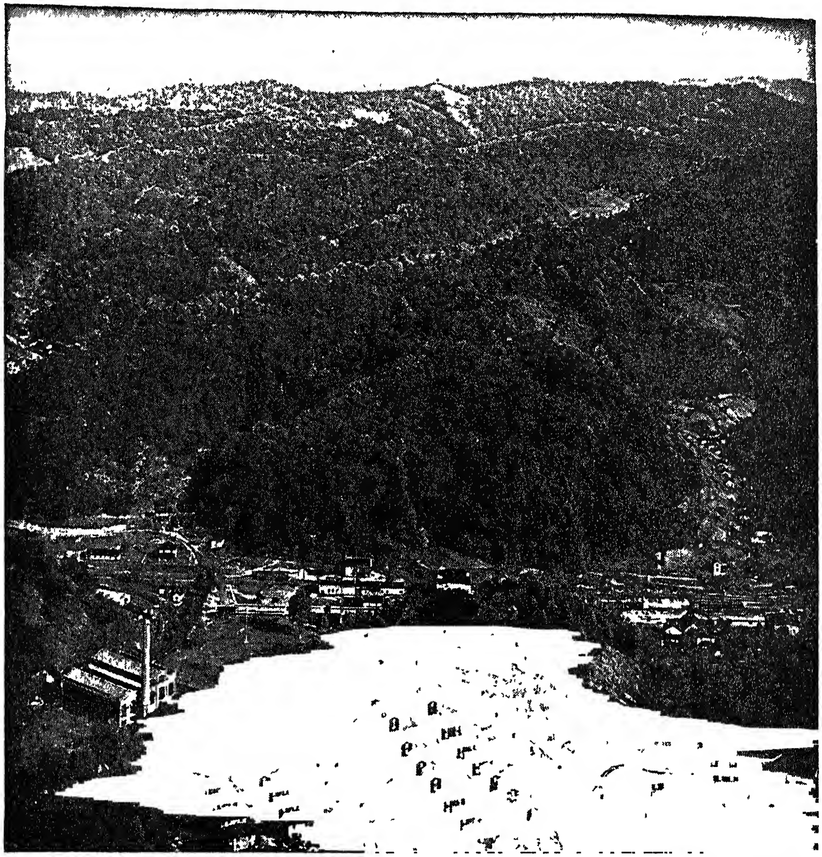


FIG. 178. A train of coal en route from a Pennsylvania mine to Cleveland. Notice the hilly nature of the land on which the city of Pittsburgh has developed

so near the surface that the overburden is stripped off and the coal is mined in open pits.

The coal mined in the Southern Appalachian Field is bituminous coal of coking quality, and much of it is used in the steel and other manufacturing industries in Birmingham or as fuel on the railroads centering there. Of these the Southern, the Louisville and Nashville, and the Illinois Central are the more important systems. The district has a favorable location for distributing coal in the Cotton Belt; but the Cotton Belt has such mild winters that people need relatively little fuel for domestic purposes. Much of the coal shipped out of the district goes to New Orleans, Mobile, Atlanta, and other cities for industrial and transportation uses.

The Illinois-Indiana Field. Unlike the coal in the other major fields, most of the coal in the Illinois-Indiana Field underlies rich farm land. In many places the huge pyramid-like hills of waste from the mines stand in fields of waving corn. Illinois and Indiana, therefore, have two layers of riches—rich land at the surface and rich seams of coal underground. The coal of the Illinois-Indiana Field is a bituminous coal which under common methods does not coke satisfactorily. At times, however, it is mixed with other coal for this purpose. For domestic and industrial uses its low to medium quality



Consolidation Coal Co.

FIG. 179. A coal-mining community in the plateau of eastern Kentucky. Seams of coal outcrop along the slopes of these valleys. Hardwood forests are the other important resource of this valley

is offset by its hard and firm structure. It may be screened and sized much the same as anthracite, and it does not crumble badly in shipping.

The Illinois-Indiana Field serves a large and expanding market in the Middle West (Figs. 175 and 78). The farms, villages, and cities together make up an important market for coal, since the winters are long, and there is but little wood for domestic fuel. In addition, the rapidly increasing manufacturing industries in the Middle West create a large and growing market for coal from this field. Illinois-Indiana coal is shipped by rail to Iowa, Minnesota, and Wisconsin, and even farther to the northwest. In sections near Lake

Superior and Lake Michigan it sells in competition with Northern Appalachian coal shipped via the Great Lakes. The railroads of this area also require coal in large quantities. Many railroads own and operate mines at points where their lines cross the coal field, while other systems have built or purchased branch lines to give entry to a mining area.

World's Coal Production. In large measure the production of coal is concentrated in North America and Europe. Three countries—the United States, Great Britain, and Germany—surpass all others in the production and use of coal. The United States has larger reserves of unmined coal than any other country, and we probably shall continue to be the leading producer for many years. Canada and Mexico both mine coal, and Canada is estimated to possess a sixth of the world's reserve of coal. Europe produces more than North America, but the production is divided among many countries. Next to Germany and Great Britain, the leading countries are France, Belgium, Poland, and the Soviet Union. The unmined coal in all these countries taken together is much smaller than that of the United States alone. Outside North America and Europe the leading countries in production are Japan, China, India, Australia, and the Union of South Africa. No one of these countries, however, produces as much as any one of the leading four states in the United States. Of them all, China has the largest reserves of unmined coal. South America mines only a small quantity of coal and has only small reserves.

QUESTIONS

A. *Production and trade*

1. What is a coal seam? Where is the Pittsburgh Seam? Why is it famous?

2. What is the difference between bituminous and anthracite coal?

3. What is a coal field?

4. What is an open-pit mine? What is "overburden"? Where in the United States is coal mined from open pits?

5. Name and give the location of each of the coal-producing fields of the Appalachian Highland (Fig. 175). What market areas are supplied by each field? What major railroads serve each field?

6. Why does coal represent a larger item in the operating costs of some manufacturing industries than in others? Illustrate.

7. Why does Great Britain commonly export more coal than the United States?

8. What country is the best customer for United States coal? To what part of that country is most of the coal shipped? From what part of the United States does it come?

9. What are the leading three coal-producing and coal-using countries? What other countries possess large quantities of coal?

B. *Coal supply of our principal cities*

1. Identify the cities shown on Figure 175. Compare with Plate II.

2. To how many of these cities is the Northern Appalachian Field the nearest bituminous coal-producing area?

3. Which of these cities are nearer other coal fields?

4. In which cities do you think competition with other fields will be most active?

5. What conditions may lead to the use of Northern Appalachian coal, even though another field is nearer?

6. Much more anthracite coal is burned in New York City than in Chicago. Why?

7. How are Pittsburgh the city and Pittsburgh the seam related?

8. If you lived in Hamilton, Ontario, where would your coal come from?

9. If you lived in Seattle, what probably would be the source of your coal?

10. If a ship loaded with coal were halfway between Portland, Maine, and Sydney, Nova Scotia, would it probably be headed toward the former or the latter? Explain.

EXERCISES

1. *Major uses of coal*

Prepare a table showing the percentage of our total consumption which is taken by each of the major classes of coal consumers.

2. *Land surface in coal-producing areas of Illinois and eastern Kentucky*

Make drawings to illustrate the type of land surface in which coal is mined in (1) Illinois and (2) eastern Kentucky.

3. *Supplementary projects*

Write an essay on one of the following topics:

1. Ways in Which Coal Is Important to Me
2. Coal Production in My State
3. A Trip to a Coalyard (A field study)
4. How City Gas Is Made from Coal (A field study)

CHAPTER XXI

IRON AND STEEL

1. *The Industry in Its World Setting*

What Iron and Steel Mean to Industry. Iron and steel products enter every branch of industry, and many of our major industries could not function without them. Machines and tools made either wholly or partly of steel are employed in manufacturing and in modern agriculture. Take away steel rails, and railway transportation would cease. Without their steel skeletons to support them the city skyscrapers would tumble in a heap of ruins. Even in remote pioneer areas steel is used to some extent. Truly this is the age of steel.

Major Producing Regions. Two regions, Eastern United States and Western Europe, produce most of the world's iron and steel. The output of the United States amounts to more than a third of the total, while Germany, the Soviet Union, Great Britain, France, Belgium, and Luxembourg produce most of the rest. Outside of Europe and North America, Japan is the leading producer. Elsewhere only small quantities of iron or steel are manufactured. China produces a little, as do India and Australia. Their production is so small that it serves merely to emphasize the leadership of Western Europe and Eastern United States.

Trade in Iron and Steel. Iron and steel and their products rank high among the commodities of world trade. In the United States the iron and steel mills produce mainly for our own needs and from our own ore. Commonly less than 10 per cent of the output is sold abroad. This emphasis on domestic trade grows out of the fact that the United States, with its great size and expanding industries, requires huge quantities of iron and steel. With such a rich home market, our manufacturers give relatively little attention to foreign trade. Our foreign markets in order of importance are Eastern Asia, Europe, Canada, and Latin America.

The iron and steel trade of Western Europe is somewhat more international than that of the United States. All the major producing countries except France import more than 25 per cent of the iron ore smelted in their furnaces, and both Germany and Belgium import more than 60 per cent. Besides supplying the big demand of domestic markets, factories in Western Europe ship iron and steel

products to other countries both in Europe and overseas. Belgium, Germany, France, and the United Kingdom all rank above the United States in the amount of iron and steel exported.

Leadership. All the world needs iron and steel. Many countries produce a little, but big production is confined to the United States and Western Europe. What is there about these two regions which gives them leadership in iron and steel? This is a big question, and two sections of this book deal with it. The present chapter answers the question for the United States, and Chapters XXIX to XXXIII, inclusive, carry the story into Western Europe.

2. *The Industry in the United States*

Divisions of the Industry. The manufacture of iron and steel divides into four phases. In the first phase the raw materials—iron ore, coke, and limestone—are assembled at a point placed conveniently between the raw materials and a market. In the second phase the ore is smelted in a blast furnace with coke and limestone in order to produce pig iron. In the third phase the pig iron is purified and converted into steel ingots in either a Bessemer or an open-hearth converter. Finally, in the fourth phase the steel ingots are rolled into rails for our railroads, into beams or rods for construction purposes, or into bars, plates, and other forms needed in our manufacturing industries. The first three phases are concerned with the basic business of making steel; the fourth, with fashioning steel into rails, rods, plates, or some of the other forms which the market demands.

Assembling the Raw Materials. One of the critical problems faced by the manufacturers of iron and steel is that of assembling the heavy, bulky raw materials without excessive cost. All our major iron and steel manufacturing districts are well placed in this respect (Fig. 180); in fact, if they were not well placed, they would not have become major districts. The problem of assembling the raw materials varies somewhat, however, from district to district, the Birmingham District being the only one in which all the materials are produced locally.

Coal and Coke. An abundance of coal suited to the manufacture of coke is one of the dependable assets of our iron and steel industry. Our coal, furthermore, is well placed for use by the major iron and steel manufacturing areas (Fig. 175). Some coal in the Northern, Middle, and Southern Appalachian fields and some of that in Colo-

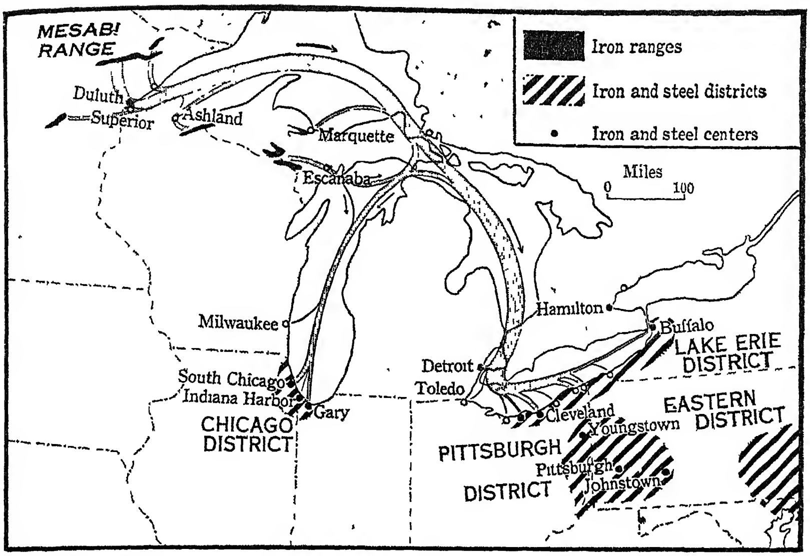


FIG. 180. Map of the major iron and steel region of the United States, showing the movement of iron ore on the Great Lakes

rado and Utah is of a quality suitable for the manufacture of coke. This fact is one of the reasons why iron and steel manufacturing is carried on in a number of places.

Iron Ore. The presence of large bodies of high-grade and easily mined iron ore is another asset of the iron and steel industry in the United States. The Pittsburgh, Lake Erie, and Chicago districts draw ore from the iron ranges near Lake Superior (Fig. 180). In fact, approximately 85 per cent of the iron ore smelted in this country comes from those ranges. To reach the steel-producing districts, the ore undergoes a rail haul of about 80 miles from the mines to a Lake Superior port and a lake haul of more than 700 miles. As iron ore is heavy and bulky, the cost of mining and transporting it from the mines to the furnaces amounts to a big item. This cost would kill the business were it not for the singular skill with which the industry has taken advantage of natural conditions at the mines and along the route.

Mining ore on the Mesabi Range. The Mesabi Range in Minnesota produces more than the other ranges combined. Because of the quantity and quality of the ore and because of the ease with which it is mined, the Mesabi is the greatest deposit of iron ore thus far worked in any country. On the Mesabi Range most of the ore is

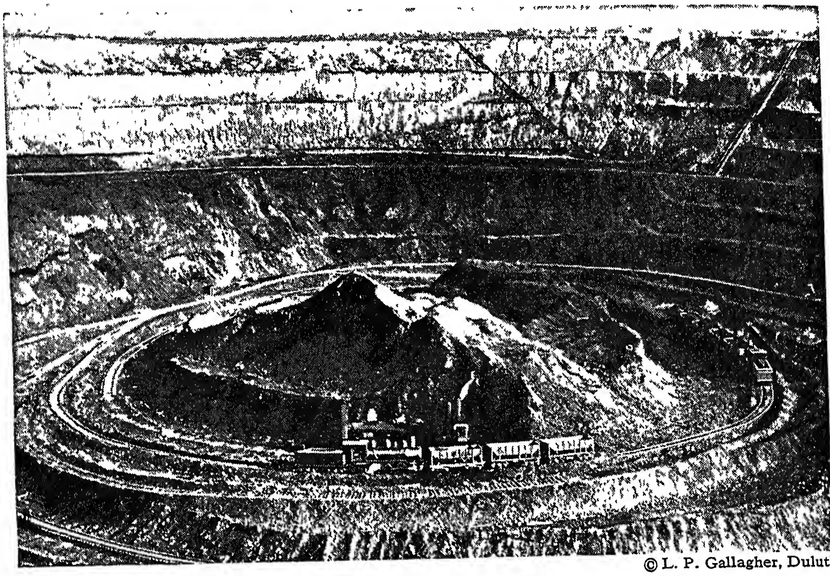


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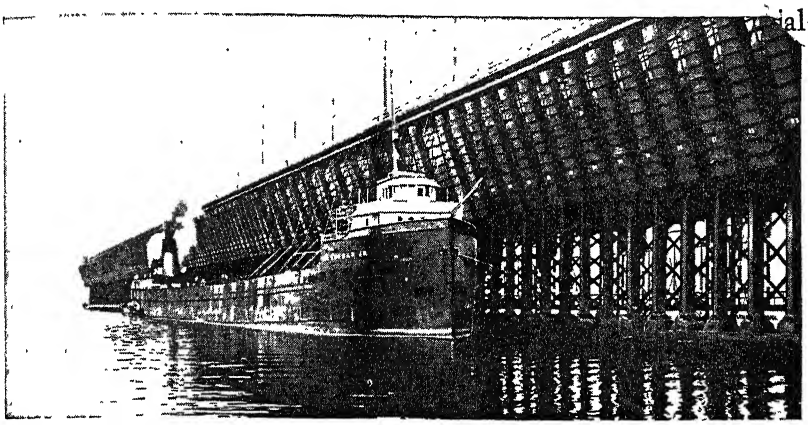
FIG. 181. Open-pit iron mine at Hibbing, Minnesota. The light-colored material in the upper part of the mine is the gravel which overlies the dark-colored iron ore. In one of these open-pit mines there are more than 70 miles of railroad tracks

mined from open pits (Fig. 181) with steam or electric shovels. The ore bodies lie perhaps 50 feet or more beneath the surface and are covered with loose sand and gravel left by the great ice sheet which long ages ago covered this part of North America. In opening a pit the mixture of sand and gravel overlying the ore body is stripped off and carried away. When the ore is exposed, mining begins. Such mining produces ore in great quantities and at low cost, the first step in delivering ore cheaply to Pittsburgh, Lake Erie, and Chicago furnaces.

Gravity docks at the ore-shipping ports. Near the mouth of the mines, trains of loaded cars are made up and are dispatched to the ore docks in Two Harbors, Duluth, or Superior. On the docks the ore is dumped automatically into great pockets beneath the track on which the cars stand (Fig. 182). These docks are built sufficiently high above the water so that the ore runs by gravity from the pockets down long chutes into the ore boats. In this way a ship measuring 600 feet long and 60 feet wide can take on 10,000 tons of ore in less than an hour. Such rapid loading constitutes one of the marvels of water transportation, for ordinarily a ship of this size requires sev-



U. S. Steel News

FIG. 182. An ore steamer loading at Duluth, Minnesota

eral days to get a full cargo aboard. These highly efficient docks, therefore, lessen the time and lower the cost of getting ore to the steel centers.

Ore boats and lake transportation. The ore boats were designed specially to carry ore and coal on the Great Lakes. They are as large as they can be under existing conditions. One of the features limiting their size is found at Sault Sainte Marie, where the boats are locked through the "Soo" Canal built around the rapids in St. Marys River. Naturally, the boats can be no larger than the capacity of the locks. Since speed as well as cost is important in the ore trade, the ore boats are fast as compared with most freighters. The blast furnaces cannot be stopped without great loss, and stocks of ore must be on hand at all times. Great Lakes navigation is closed, however, from December 15 to April 15, and thus all ore shipped by the lakes must move during the open season. This puts a premium on big boats, on speed in loading and unloading, and on efficient operation of the boats while en route.

Unloading ore at the receiving ports. Machines invented for the purpose save time and expense in unloading the ore boats at Lake Erie or Lake Michigan ports. Huge buckets scoop up the ore and hoist it out of the hold to waiting cars or to an ore pile. On the same docks or on docks close by, automatic car dumpers unload cars of coal into the ships for the return trip. As the amount of ore moving south is much greater than that of the coal moving north, many boats make the return trip in ballast.

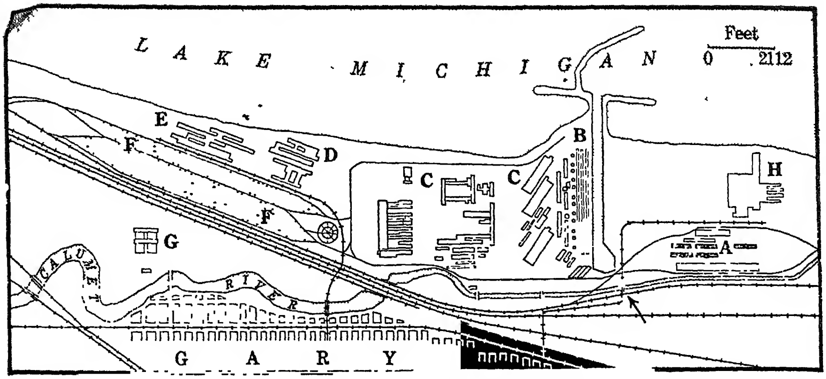
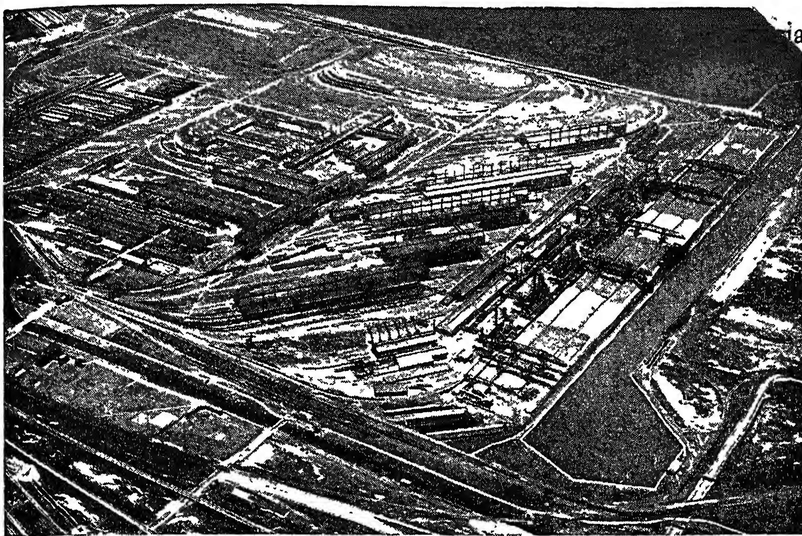


Fig. 183. Layout of the iron and steel plant at Gary, Indiana. *A*, coking plant; *B*, ore piles, blast furnaces, and converters; *C*, rolling mills; *D*, sheet mill; *E*, tin mill; *F*, switchyards of the Chicago Outer Belt Line; *G*, bridge company; *H*, tube mill. Lake steamers discharge iron ore and limestone alongside the blast furnaces at *B*. Coke is brought from the coking plant at *A*. From *B* the pig iron moves through rolling mills to come out as steel rails, plates, rods, or in some other form

Layout of an Iron and Steel Plant. Because of its size and the number of its departments, a modern iron and steel plant is laid out so as to avoid waste of space and of time in operation. The great plant at Gary, Indiana, for example, is so arranged that everything moves from east to west (Fig. 183). At the east great piles of iron ore, coal, and limestone are left at the docks by lake freighters or are brought by rail. Then, in convenient order, come coke ovens, blast furnaces, Bessemer and open-hearth converters, and rolling mills. All departments of the plant are connected by railroad, and thus materials can be moved rapidly from place to place. Most of the buildings in a steel plant are huge one-story structures built low and broad, rather than tall and narrow, because the large and heavy materials are handled most economically on one level (Fig. 184). Therefore, in choosing a location, a steel-manufacturing company selects one with room for an adequate plant layout and for expansion of the plant as the business grows.

The Blast Furnace Extracts Iron from the Ore. The blast furnace extracts iron from the ore, this process being the first step in the manufacture of steel. Pure metallic iron rarely occurs in nature. When iron is exposed to air and moisture, it rusts, or oxidizes; that is, the chemical element iron combines with the chemical element oxygen, forming a new substance, such as the rust on the blade of



Chicago Aerial Survey

Fig. 184. Central part of the iron and steel works at Gary. The view looks toward the lake, as indicated by the arrow in Figure 183. From right to left are (1) the slip where freighters discharge iron ore and limestone, (2) blast furnaces (*B* of Figure 183), and (3) rolling mills (*C* of Figure 183). Railway tracks and yards occupy the foreground

a knife. Iron ore, therefore, contains iron, but it also contains oxygen and other impurities. The function of the blast furnace is to separate the iron from the impurities of the ore. This is accomplished by filling the furnace with a mixture of ore, coke, and broken-up limestone, and then subjecting the mass to a blast of terrifically hot air, blown in near the bottom of the furnace. The lower part of the mass becomes white hot. The heat, with the aid of the carbon from the coke, drives off the oxygen. The iron becomes a liquid and trickles to the bottom of the furnace. Meanwhile the limestone, the ash from the coke, and the earthy impurities in the ore combine into a liquid called slag. The slag also trickles to the bottom; but, being lighter than iron, it floats on the surface of the molten mass. This permits the molten iron to be drawn off at intervals into molds called pigs or into huge ladles which carry it to the steel furnace. The slag is drawn off at a higher level.

When the coke in the blast furnace burns, gas is formed. This is drawn off from the top of the furnace and is used to heat the air in the blast furnace or to raise steam to run the fans and other ap-

paratus. Thus the manufacturer saves expense by using a by-product. At Gary, gas from the furnaces, together with gas from the by-products ovens, supplies power for all the machinery and electric generators in the plants, operates the unloaders at the docks, and helps to light the city.

Because of the terrific heat of a blast furnace, great quantities of water are needed to protect the lining and connecting parts of the furnace. Therefore, a water system for cooling is a necessary part of a blast furnace. In addition, water is needed in practically all parts of a steel mill. One writer estimates that the Illinois and Indiana steel companies at their huge plants in South Chicago and Gary together require as much water every day as the city of Chicago uses for municipal purposes. This need of water means that a modern steel plant must have a location on a lake or river where water may be obtained abundantly and cheaply (Fig. 185).

Making Steel from Pig Iron. In passing through the blast furnace, the iron takes up carbon from the coke and retains impurities contained in the ore. The impurities make pig iron so brittle that it is not suited for most uses. In the converters, which change pig iron to steel, the impurities in the iron are removed and the carbon is reduced to the amount required in steel.

There are two processes of making steel in general use, the Bessemer and the open-hearth. The Bessemer is the cheaper process and requires only about ten minutes. It is adapted, however, only to pig iron made from relatively high-grade ore. The open-hearth process requires approximately ten hours; but because it can work iron of lower grade, it is more widely used than the Bessemer process. As the molten steel comes from these converters, or furnaces, it is poured into molds called ingots, and the basic business of steel-making is completed. There remains, however, the task of fashioning the ingots into the many shapes, or forms, which the market demands.

The Rolling Mill. Hot or molten steel is shaped by pouring it into molds, by hammering it in a forge, or by rolling it into a desired form. Of the three processes, rolling is in most general use, and the rolling mill is an essential part of a steel plant. In the rolling mills the ingots are brought to a certain temperature and then are passed between great rolls of steel. Steel rails for our railroads are made in this way, as are rods, plates, bars, and other structural forms. In some plants the finished rails come out about a quarter of a mile

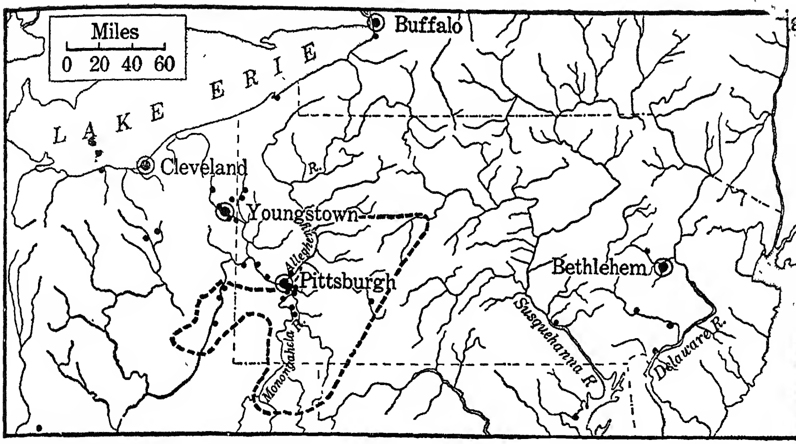


FIG. 185. Blast furnaces in Pennsylvania and neighboring states. In recent years one or more blast furnaces have been operated in each of the places shown on the map. The large circles indicate the more important centers. Note the relation of dots to the streams and lakes. The broken line encloses the principal coal-producing area

from the starting point. The rolling mill does not turn out as fine a steel product as can be obtained by the other processes, but it has the advantages of speed and cheapness.

Iron and Steel Products Become the Raw Materials of Other Industries. In many instances the products of the rolling mills and forges become the raw materials of other lines of manufacture. In case a factory uses large quantities of such raw materials, it finds advantage in being near the iron and steel plants. The iron and steel mills are benefited in turn by having a near-by market for part of their output. As a result, many manufacturing establishments cluster about the furnaces and mills (Fig. 183). Pullman, Illinois, and Hammond, Indiana, for example, are near neighbors of the great steel mills in South Chicago, Indiana Harbor, and Gary and specialize in the manufacture of railway cars, steel tanks, and other steel products. Much iron and steel, however, is shipped from the steel town to New York, Philadelphia, Detroit, and the other great manufacturing centers.

Foundries and Their Function. Foundries are not localized in a few districts, as are the iron and steel plants, but appear in every city in the country. The purpose of a foundry is to cast pig iron, lead, brass, or other metals into a form needed by a local industry.

Thus, if a part of a machine or other cast-iron article is broken, the owner does not need to send to a distant point to replace it, for he can have a duplicate made in his home town. The castings are made by pouring molten iron into molds of sand. Cast iron is used principally for making articles for which cheapness is more important than strength and elasticity. Cast-iron pipe, culverts, freight-car wheels, stoves, some kinds of hardware, and steam radiators are examples. In many instances railway car shops at division points operate a foundry in connection with their construction and repair work.

3. *Major Iron and Steel Districts of the United States*

In the United States most of our iron and steel is manufactured in five districts. The Eastern District includes such blast-furnace centers as Baltimore in Maryland, and Bethlehem, Harrisburg, and Philadelphia in Eastern Pennsylvania. In addition, many steel-using centers in New Jersey, New York, and Southern New England are included in the district. The Pittsburgh District includes the great plants in Pittsburgh and near-by cities of Pennsylvania and those at Youngstown and lesser centers in the eastern part of Ohio (Fig. 185). The Lake Erie District is made up of Buffalo, Cleveland, and smaller centers on Lake Erie, and the Detroit area of Michigan. The Chicago District includes the furnaces and mills in Chicago, the plants in Indiana Harbor and Gary, Indiana, and a number of smaller developments. The Birmingham District centers in Birmingham, Alabama, and includes a number of near-by towns. In addition to these major districts, there are mills of some importance in the western part of Virginia, in Duluth (Minnesota), in Pueblo (Colorado), in Provo (Utah), and in a few other places.

The Eastern District. In general, the Eastern District is characterized by many small plants rather than by a few large ones. There are, however, plants of large size at South Bethlehem, Steelton, and Lebanon in Pennsylvania, and at Sparrows Point, near Baltimore. Coking coal is brought from West Virginia and the western part of Pennsylvania. Some ore is mined locally, some comes from the Lake Superior ranges, and some is imported from Cuba, Chile, Sweden, Spain, or elsewhere. The use of foreign ore in this district reflects the low cost of ocean transportation.

The Eastern District fringes the manufacturing and commercial region extending from Baltimore through Philadelphia and New York to Boston. As a result, the iron and steel mills have a near-by and active market for their output. The district also contributes an important share of the American iron and steel exported overseas. It ships increasing quantities through the Panama Canal to the Pacific Coast of both North and South America.

The Pittsburgh District. Of the principal iron and steel manufacturing districts in the United States, the Pittsburgh District long has ranked first in output. It consumes more ore, uses more coke, and turns out more iron and steel products than any other district in the world. Were it the only American producing district, the United States still would lead in the manufacture of iron and steel.

Advantages in securing raw materials. In manufacturing iron and steel the Pittsburgh District has the advantage of cheap coal and coke. Coking coal is drawn from the Pittsburgh Seam of the Connellsville-Uniontown Basin (Fig. 176) by a short down-grade haul. To plants near the city of Pittsburgh, coal for raising steam is brought either in barges from mines along the Monongahela River or by rail from mines almost in sight of the mills. Limestone comes by rail from quarries in the south-central part of Pennsylvania. Iron ore is brought mainly from the iron ranges near Lake Superior. Although the ore is hauled nearly a thousand miles, by taking advantage of the Great Lakes, it is laid down at the Pittsburgh furnaces at reasonable rates.

Market advantages. The iron and steel plants in the Pittsburgh District are well placed for marketing their products. There is an enormous consumption of iron and steel within the district itself. In fact, upward of 2500 plants in Pittsburgh and its environs are engaged either in making iron and steel products or in making articles partly of iron or steel. Pipes and tubes, chains, boilers and tanks, engines, wire fencing, hardware, and a host of other things are made in large quantities. An important part of the business of the blast furnaces and converters is to supply the iron and steel needed by these local factories. In competing for more distant markets, the Pittsburgh District benefits from its position between the manufacturing and commercial cities of the Eastern Seaboard and the rapidly growing cities of the Middle West (Fig. 175 and Plate II).

The Lake Erie District. The Lake Erie District is well equipped for making iron and steel. Limestone for the Lake Erie furnaces is

quarried on islands in the lake. Coking coal comes largely from the Pittsburgh Seam, east of Pittsburgh, and thus must be hauled farther than that used in the Pittsburgh District. The freight rates are relatively low, however, because coal is brought as return freight in the cars which carry iron ore from Lake Erie ports to the Pittsburgh furnaces (Fig. 178). In getting iron ore the Lake Erie mills possess the advantage of having the ore delivered from the lake freighters directly to their yards (Fig. 180). As compared with mills in the Pittsburgh District, they are saved the cost of a rail haul of about 140 miles and the expense of loading and unloading the cars. The importance of a location on the lake is shown by the fact that one of the companies now operating in Buffalo formerly was located at Scranton, Pennsylvania.

In marketing their products the mills in the Lake Erie District share with those in the Pittsburgh District a position between the Eastern Seaboard and the Middle West. They can ship by rail, or by lake and rail, to Eastern cities. They also can ship by water to Lake Superior and Lake Michigan points. In addition, Detroit and all the iron and steel cities on Lake Erie are centers for lines of manufacturing which use a considerable amount of iron and steel.

The Chicago District. Iron and steel mills in the Chicago District share with the mills on Lake Erie the advantage of having iron ore and limestone delivered to their yards by lake freighters. Iron ore comes from the Lake Superior ranges; limestone, from the west shore of Lake Huron and several other localities. Some of the coking coal originates in Pennsylvania; but increasing quantities come from West Virginia and Kentucky, where, in many cases, it is taken from mines owned by the steel companies. From any of these areas a railroad haul of at least 500 miles is involved (Fig. 175 and Plate II).

The newer plants in the Chicago District, being of relatively recent construction, have sufficient room to carry out the ideas of plant layout held by leaders in the industry. Large acreages of land were obtained by selecting sites fronting on the lake outside the built-up portion of Chicago. This land was acquired cheaply, because the city's growth had not reached it, and it was too sandy or too wet for farming. Water-front sites enable the steel companies to construct their own docks and to control their water supply. Belt lines of railroad connect the mills with all the railroads entering Chicago (Fig. 94).

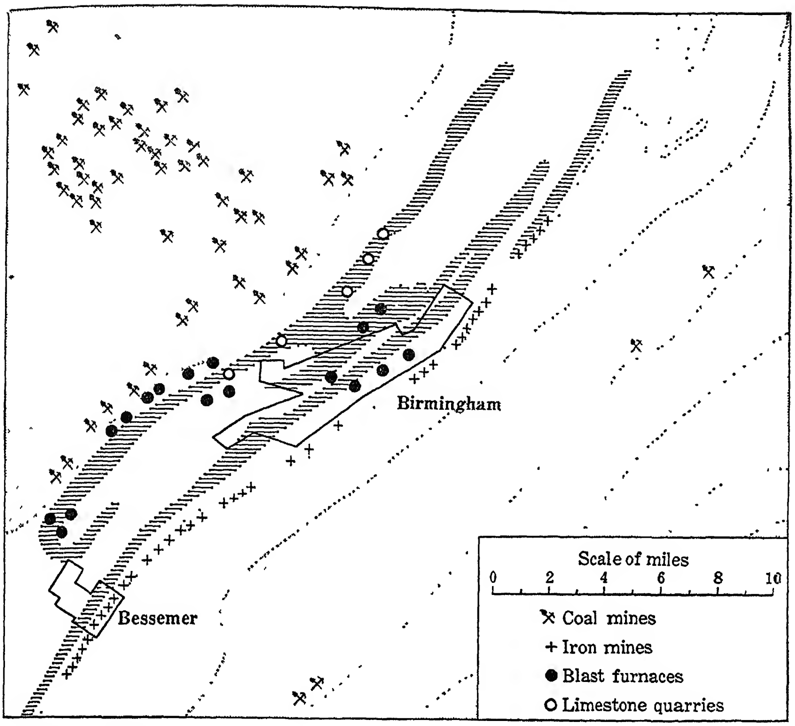


FIG. 186. The Birmingham, Alabama, district. All the raw materials for the manufacture of steel are produced in this area

The iron and steel plants of the Chicago District have a big local market and the advantage of a great railway center. The metropolitan area contains many establishments specializing in the manufacture of wire fencing, farm implements and tools, and other supplies for the farming areas of the country. It also contains many plants producing railway rolling stock, bridges, and other materials. It has large petroleum refineries and many factories making steel furniture and supplies. The numerous railways centering in Chicago add much to the importance of the local market, for railroads normally buy from a third to a half of the national output of iron and steel.

The Birmingham District. The Birmingham District has the advantage of getting coal, iron ore, and limestone within short distances of its furnaces. The beds of rock containing the iron ore and limestone extend in narrow belts from northeast to southwest, and the furnaces and mills are strung along a line centering in Birmingham

(Fig. 186). The iron ore coming to the furnaces varies notably in quality, even that from a single mine. To produce a uniform product from ores varying in quality is a major problem of the industry; but the problem has been solved, and the industry has prospered. Steel-using industries are numerous in the Birmingham District. The railroads of the Cotton Belt require large quantities of iron and steel, and the expanding industries of the South furnish a large market.

QUESTIONS

1. Why is the present period of history known as the age of steel?

2. What is iron ore? What must be done to it before it becomes a useful material of commerce?

3. How is coke made and what by-products are obtained?

4. What step in the transportation of iron ore illustrates the principle of gravity? Why is speed important in shipping iron ore via the Great Lakes?

5. Why are the several parts of a steel plant arranged in orderly sequence?

6. Why is a big and level site of importance in manufacturing iron and steel?

7. Why is there a foundry in nearly every small city of the country?

8. If you were planning to build an iron and steel plant, what considerations might lead you to place it in the Lake Erie District? What ones might take you to the Birmingham District? If you planned to turn out steel rails exclusively, in which iron and steel district would you locate your plant?

9. The United States is the leading producer of iron and steel. Why is it not also the leading exporter of iron and steel?

10. Why is the steel industry of Western Europe more international in character than that of the United States?

EXERCISES

1. *Iron ore to steel rails*

In a short written report, trace the story of iron ore from an ore body on the Mesabi Range until it appears as steel rails on a Middle Western railroad.

2. *A steel-manufacturing district*

Select one of the major steel-producing districts and indicate its location on an outline map of the United States by coloring in red the major iron and steel cities. Show the source of iron ore in orange on the same map, that of coal in black, and that of limestone in gray. Sketch in the routes by which the raw materials will travel to the iron and steel centers. Finally, color in green the areas where you think the steel products are marketed.

CHAPTER XXII

COPPER AND THE ELECTRICAL INDUSTRIES

Copper in Ancient and Modern Times. Long ago, perhaps about 3500 B.C., men began to use copper, at first by itself and later as bronze, an alloy of copper and tin. The use of copper and bronze so changed living conditions that mankind advanced from the Stone Age into the Bronze Age. Centuries later the use of iron brought the Iron Age and, in time, introduced the modern period of machinery and invention. This modern period calls for an ever-increasing use of many minerals and metals, of which iron and copper are the most important. It also calls for great quantities of electrical power and in connection with the generation and distribution of this kind of power copper has found its greatest service.

The use of any metal is dependent upon its properties. Copper, unlike iron, does not rust and wear away. Once in use, always in use, is the rule for copper. Copper is also malleable; that is, it can be quite easily hammered into desired shapes. Copper alloyed with zinc forms brass, which is stronger and harder than copper, has the same resistance to weather, water, and chemical action, and is easily made by machinery into wire, pipes, and other forms. Because of these properties brass is much used aboard ships, where it withstands the attack of salt spray and weather. In fact, the brass and bronze industries are so important today that they constitute an important market for copper.

Copper-Producing Areas. Copper deposits are widely distributed, copper being mined in more than thirty countries (Fig. 187). Up to the present the great highlands bordering the Pacific in North and South America have produced most of the world's copper. Since there are important mines in Alaska, Canada, the United States, Mexico, Peru, and Chile, these highlands contain copper at intervals throughout their entire length. The United States and Chile are the leading producing countries. Chile led from 1850 to 1883, but since that time the United States has occupied first place; in fact, of the 48 million tons of copper produced from 1801 to 1934 the United States contributed about half.

In terms of present production and reserves of ore four regions stand out: (1) Western United States, (2) the Andean region of South America, (3) the Belgian Congo–Northern Rhodesia region

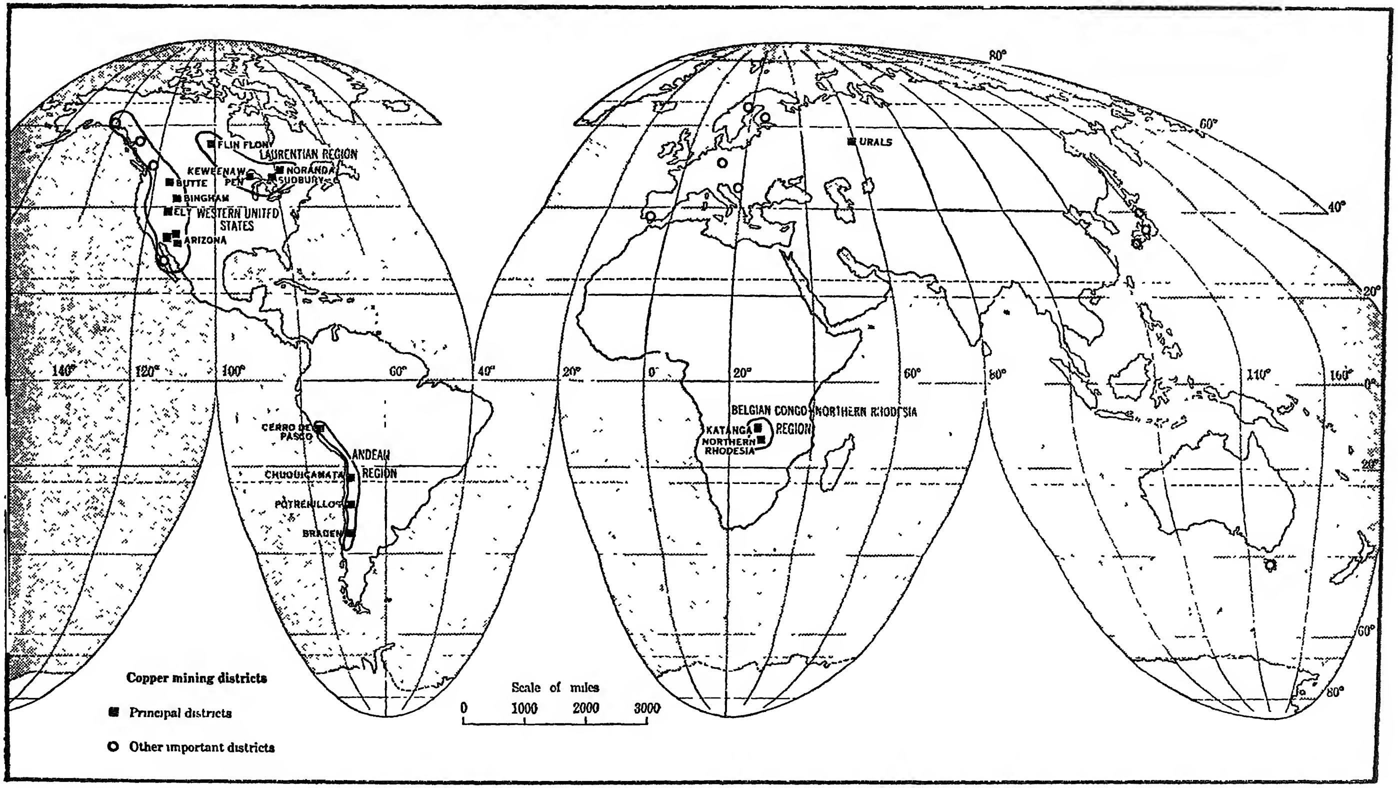


FIG. 187. Copper-producing areas of the world. Four regions contain *most* of the world's copper

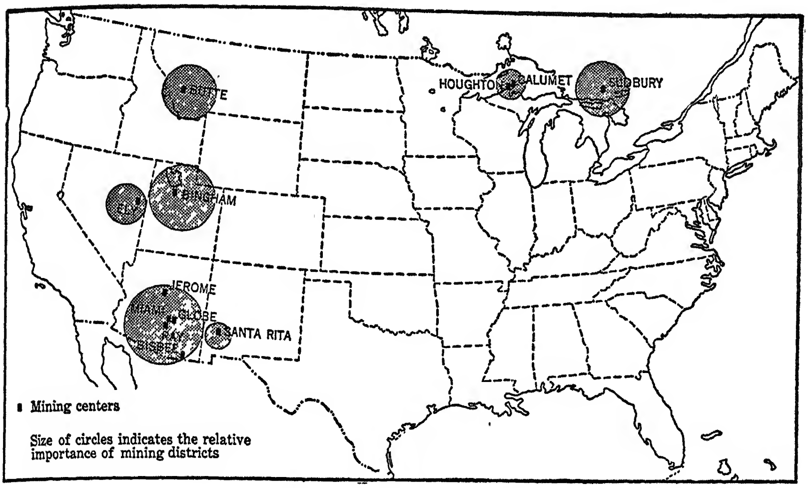


Fig. 188. Copper-mining centers of the United States. Circles show relative production in a recent year

of South Africa, and (4) the Laurentian region of the United States and Canada (Fig. 187 and Plates III, IV, and VIII). Of the other producing regions, probably the Ural Mountain–Siberian section of the Soviet Union contains most ore. The deposits, however, are mainly low grade in quality.

Western United States. Copper deposits occur in many of the mountains and basins of Western United States. With the exception of Wyoming each of our eleven Western states produces some copper, but the major producing areas are in the four states of Arizona, Montana, Utah, and Nevada (Fig. 188). The most famous single district is at Butte, Montana, near the Continental Divide in the northern Rockies. This district has been in continuous operation for three quarters of a century and produces silver, lead, zinc, and gold as well as copper. Its huge production makes it one of the greatest mining districts of all time, ranking in this respect with the Rand, the great gold-mining district of South Africa.

The Great Basin of Utah and Nevada contains several copper-mining districts, the leading ones being the Bingham District of Utah and the Ely District of Nevada. The Bingham District, one of the great copper-producing districts of the world, lies on the east slope of the Oquirrh Mountains, 26 miles southwest of Salt Lake City (Plate III). The slopes of the range are cut by narrow, steep-sided

canyons, one of the largest of which is Bingham Canyon, where the great mine is located. The deposits lie near the surface (Fig. 8), and huge electric shovels mounted on caterpillar tractors dump the ore directly into railroad cars. This cheap way of mining offsets the fact that the ores are of low grade; that is, each ton of ore contains only a small amount of copper. Fortunately, some silver, lead, zinc, and gold are secured also, and these help to pay the cost of operation.

For many years Arizona has been the leading state in the United States and the leading area in the world in copper production. On the basis of past and probable future production, there are fifteen Class A copper districts in the world. Four of these are in Arizona. Much of the Arizona ore has commanded a premium not only because of its freedom from arsenic and certain other impurities but because of the ease with which the ore is reduced.

Copper in the Andes. The copper output of the Andes comes mainly from four big mines, one in Peru and three in Chile. All these mines are worked by United States companies, and each one presents difficult and unusual mining conditions. The Cerro de Pasco mine of Peru, for example, is some 200 miles northeast of Lima and lies more than 14,000 feet above sea level. Many of the American engineers had to be sent home because they could not work at such high altitude, and even the natives get tired quickly at this elevation. Engines and furnaces gave trouble in the rare mountain air until a new method of firing was perfected. The company also had to build a railroad, install a hydroelectric power plant on a mountain stream, open coal mines, construct a smelter, and do many other things before the costs of mining were lowered enough for the mine to compete in the world markets.

Chuquicamata, the most northerly of the three great copper mines in Chile, is in the heart of the Atacama Desert, about 150 miles northeast of the port of Antofagasta (Plate IV). The mine is working an entire mountain of ore, the greatest single deposit of copper ore in the world. The second Chilean mine is near the margin of this barren desert, some 200 miles south of Antofagasta. The third, or Braden, mine is in the high Andes of Central Chile, about 80 miles southeast of Santiago. It is one of the lowest-cost producers in the world. The output of these three mines varies with the world demand for copper. Commonly most of the output goes to the United States, and we import more copper from Chile than from any other country.

African Copper. Until a few years ago no major copper deposits were known in the Old World, the great producing areas being in the Americas. Recently, however, two great copper areas have been discovered in Africa. One is in the southern part of Belgian Congo, and the other is in the central part of Northern Rhodesia. Both areas lie in a grass-and-bush wilderness on the great African Plateau and are more than a thousand miles by rail from the sea.

The largest deposits and greatest production are in Northern Rhodesia. This is British territory, and although British capital dominates the area some American interests are represented. The region lies at approximately 4000 feet above the sea and has a monotonous, undulating surface. Climatically the area is pleasant for white people because the elevation offsets the heat of the sun. Labor for the mines is drawn from the native population, but the officials come from Europe or America. The copper ores are found at the surface, and the ore is mined with shovels in open pits. Production, mainly from three large mines, has increased rapidly. The known reserves make this the world's greatest copper district. The ore contains about 4 per cent of copper, and this is richer than most American ores. Practically all the copper is sold in Western Europe; for our great production and high tariff on copper prevent it from being sold in the United States. The discovery of these big African deposits has broken the New World monopoly on copper and is changing the course of the oversea trade in this essential metal.

The Laurentian Region of the United States and Canada. The Laurentian area contains both the oldest and the newest of the large copper-producing districts of North America. The oldest district lies in the United States and is in the Keweenaw Peninsula of Northern Michigan. The district is unique in that the copper occurs as pure copper. Mining began in 1849, and, in terms of total production from that time to the present, the district is the second largest producing area in the world. The newest of the large copper-producing districts of North America is the Sudbury District of Canada. The area lies north of Lake Huron, and the copper is produced as a by-product of nickel-mining. The other Canadian districts have large quantities of ore, but production is not large as yet.

Producing Copper. Before copper is ready for the manufacturer it goes through four processes: mining, concentrating, smelting, and refining. Mining may be done by underground methods, as at Butte;

or by open-cut methods, as at Bingham, Utah, or Bisbee, Arizona. Concentrating is accomplished by crushing and grinding the ore in a mill at or near the mine. The ore as it comes from the mine contains only minute particles of copper-bearing mineral, and thus the cost of hauling it for any distance would be prohibitive. A ton of ore from Bingham, for example, contains only from 14 to 20 pounds of copper. All the rest is waste, or tailings. To get rid of this waste, the ore commonly is concentrated by crushing, grinding, or other methods at or near the mine.

After the copper-bearing mineral is concentrated it is shipped to a smelter which may or may not be in the vicinity of the mine. In the smelter the concentrate is roasted to drive off some of the impurities (notably sulphur). The resulting product, mixed with limestone and coke, is then fired in a furnace. This process yields copper matte (and slag, which is dumped). The matte contains impurities, and thus, while it is still hot, it is further purified in a converter. The product of the converter is called blister copper and is more than 96 per cent pure copper, other metals making up the rest. The blister copper is in most cases shipped to an electrolytic refinery where the copper is purified, and the impurities, such as silver, gold, or nickel, are collected and separated. The copper is cast into shapes ready for shipment to brass foundries or wire mills.

As a general rule the mining and the manufacture of copper are carried on in different parts of the world. Most of the copper-manufacturing industries are in Northeastern United States or in Western Europe, whereas the copper-mining districts are in remote and arid highlands. This distribution means that copper must be shipped long distances. It is to lessen the cost of transportation that the ore commonly is concentrated and smelted in or near the mining districts. Much of the refining, however, is done in the manufacturing areas; for example, at seaboard in Maryland, New Jersey, and New York in Eastern United States; and at coastal points in Great Britain, Belgium, and Germany in Western Europe. Blister copper, the product of the smelters, is the form in which much of the copper is shipped.

The story of the production of copper, of course, varies somewhat in each of the great producing districts. In some districts, as at Butte, the copper ore is of such high grade that it goes directly to the smelters without being concentrated. For the United States as a

whole, however, about three fourths of the ore is concentrated before it is smelted. In Butte, Montana, the mines are at Butte; the smelters are at Anaconda, 27 miles away; and the refinery is at Great Falls, where the falls of the Missouri are utilized to provide the necessary electricity. In Utah and Nevada the concentrating and smelting are carried on in the vicinity of the mines, but much of the blister copper is refined at Baltimore, Maryland. Much of the Arizona ore is concentrated and smelted near the mines, but the refining is done in the vicinity of New York City. These same refineries treat some of the copper from the Andes. The Braden mine in Chile, however, has its own smelting and refining plants.

Manufacturing Copper. Copper by itself or alloyed with other metals is made into a great variety of useful things (Fig. 189). The greatest demand, as has been stated, comes from the electrical industries, and the rapid increase in our use of electricity and electrical equipment in recent years has meant a corresponding increase in the demand for copper. Of the alloys of copper with other metals, brass and bronze have always been the most important. Recently, in the search for new metals for industry, much attention has been directed to alloying copper with nickel, aluminum, iron, and other metals. Some of these are now in successful use, and in the future we can expect increased demand for these new aids to industry. Chemical manufacturing is another industry which calls for increasing quantities of copper. Copper sulphate, for example, is needed in printing and in dyeing cloth. All these are peacetime uses. When nations are at war, the demand for copper greatly increases.

The Electrical Industries. Electricity represents power in motion. The power may be derived from falling water or from coal. Formerly people had to move to a power site if they wished to use water power. Now, by means of a copper or aluminum wire or cable, power can be moved to the people. Most coal still travels to the consumer; but power developed from coal can be transformed into electricity and transmitted to the consumer. Electricity is a fine type of power for many factories, since by means of motors and switches it can be used in large or small lots and for long or short intervals. Electricity produces certain types of chemical reactions, and certain metal alloys cannot be produced without it. All these electrophysical, electrochemical, and electrometallurgical processes and many other uses are making for an electrical civilization.

Types of Use	Per Cent of Total Copper Used in the United States
Electrical manufactures (generators, motors, electric locomotives, switchboards, light bulbs, etc.)	22
Automobiles	14
Rod and wire	12
Light and power lines	10
Buildings (other than electrical work)	9
Castings (bearings, bushings, lubricators, valves, etc.)	5
Telephones and telegraphs	3
Radio receiving sets	3
Refrigerators	2
Ammunition	2
Manufactures for export	4
All other uses (wire cloth, air conditioning, shipbuilding, copper-bearing steel, coinage, etc.)	14

FIG. 189. Estimated use of copper in the United States

The use of electricity calls for generators, power lines, condensers, and a great number and variety of machines. As a result numerous industries have come into prosperous existence to make machines and equipment. The telephone and telegraph companies have manufacturing divisions which turn out the switchboards, telephones, and other appliances required in their operations. Other companies produce almost every type of equipment from radio sets to electric locomotives. The value of the output of all these industries ranks them with the automobile and other gigantic American enterprises.

Most of the concerns manufacturing electrical equipment and supplies are located in the major manufacturing belt of this country (Fig. 78). In the demand for copper three sections of the belt are outstanding. The first is the seaboard section, with large production in Philadelphia, Metropolitan New York, Metropolitan Boston, and Schenectady. The second is the central section, with Cleveland and Pittsburgh leading. The third section lies at the western end of the belt, in Illinois and Indiana. The Chicago industrial area is, in fact, the leading center in the entire industry.

International Trade in Copper. For many years the United States has dominated the international trade in copper. We have mined more copper, imported more copper, refined more copper, manufactured more copper, and sold more copper than any other country. The trade centers in the refining and manufacturing industries of

New York and near-by sections of the Atlantic Seaboard. To this refining and manufacturing seaboard area comes much of the copper mined within the United States and much unrefined copper from Chile and other foreign countries. More than 95 per cent of our copper imports are made up of ore, concentrates, and unrefined metallic copper. These products are treated in our smelting, refining, and manufacturing plants, and some of the refined copper and manufactured copper goods are then sold abroad. Our principal market is in Western Europe, the United Kingdom, Germany, and France being our leading customers. Japan, British India, China, and, in fact, most countries of the world also look to us for copper and for goods made wholly or partly of copper.

In recent times the dominance of the United States in the world's copper trade has been challenged by the opening of the African and Canadian mines and by the perfection of the processes by which copper is refined as well as smelted in Chile. Many of the foreign mines, however, are owned or partly owned by American firms, and the United States is still the leading factor in the international trade in this important metal.

QUESTIONS

1. What four processes are involved in getting copper into the form needed by the manufacturer? Which processes commonly are carried on in or near the mining districts? Why? Which process commonly is carried on in the manufacturing area? Why?

2. Should you expect Canada to be more or less important in copper-mining in the future? Explain.

3. What other metals are produced in some copper-mining areas?

4. In what ways has the use of electricity increased the demand for copper?

5. What is an alloy? With what other metals is copper commonly alloyed?

6. Where are the major sections of the United States in which electrical equipment and supplies are manufactured?

EXERCISES

1. *Places and areas of importance in the copper industry*

Show in the form of a table what each place or area in the following list means to the copper industry: Butte, Anaconda, Great Falls, Bingham, Ely, Keweenaw Peninsula, Southern Arizona, the Sudbury District, Cerro de Pasco, Northern Rhodesia, Belgian Congo, the Ural Mountains, seaboard section of New Jersey, Schenectady, Chicago industrial area.

2. *The United States and the copper industry*

State and explain in writing the position held by the United States in copper-mining, in copper-manufacturing, and in international trade in copper since 1883.

3. *Characteristics of copper-mining districts*

Characterize each of the four major copper-mining regions of the world as to climate, surface features, altitude above sea level, and relative distances from the major copper-manufacturing areas (see Figs. 14 and 15 and Plates I, III, IV, and VIII).

CHAPTER XXIII

PETROLEUM

Petroleum Products. Petroleum reaches its consumers as many different substances, each adapted to special uses. By a process of distillation known as fractioning, refiners separate the numerous substances of which crude oil is composed. Of the many petroleum products on the market, four are particularly important because of the large quantities consumed or because of the essential uses which they serve. Lubricating oil, gasoline, fuel oil, and kerosene are among the essentials of modern industry and commerce.

Lubricants and lubrication problems. Most of the lubricants now in use are derived from petroleum, and for this reason petroleum would play a significant part in modern life even if it served no other purpose. Without lubricants industry and transportation would be paralyzed. For example, the Allied troops, following the retreating German army in 1918, found many trucks abandoned, not for want of fuel, but because they had been ruined by lack of proper lubricating oil. Cut off from their customary supplies of lubricants, German chemists had failed to find satisfactory substitutes for the oils and grease made from petroleum.

Modern machinery, being of endless variety and operating under many different conditions, presents a host of lubrication problems. The automobile engine, for example, is built for high speed and requires an oil which will offer the least possible resistance to its motion. The wheels of a freight car, on the other hand, move at comparatively low speed, but sustain a weight so great that thin oil would be squeezed out of the bearings. Grease rather than oil is suitable for this type of joint. Refrigerating machinery and the automobile driven in zero weather require an oil which will not "freeze up." Certain machines in steel mills must be lubricated with oils not likely to burst into flame when subjected to intense heat from the molten metal. Lubricants suitable for these and many other conditions are derived from petroleum.

Gasoline and its role in transportation. The changes wrought by gasoline in our economic life are a fitting climax to a century of progress in transportation. George Washington's carriage did not differ much in principle from the chariots used by ancient Egyptian kings three thousand years before, but in the last century transporta-

tion has been revolutionized. Coal and steam brought the locomotive and the steamboat, and more recently the perfection of the gasoline engine has given us the automobile and the airplane.

Gasoline has had a most spectacular history. In the early years of the petroleum industry it was a troublesome waste product, but refiners now rejoice over the discovery of methods that increase the gasoline yield. The modern refinery transforms other petroleum products into gasoline by heating kerosene, fuel oil, or gas oil under pressure to bring about a chemical change; and thus refiners can adjust the proportion of gasoline and other products to suit the demand. This process, known as cracking, accounts for nearly half the gasoline produced in the United States. Furthermore, cracking yields anti-knock gasoline, suitable for high-power automobiles and airplanes.

Fuel oil competes with coal. More petroleum is burned for fuel than is used for any other purpose. The use of fuel oil for domestic heating is large, and its use for both land and water transportation has increased greatly during recent years. More than a fourth of the world's ships now use oil. It is estimated that a big ocean liner, by burning oil instead of coal, saves 5000 tons of fuel on one round trip between Liverpool and New York and needs only 30 stokers instead of the 300 required to fire a coal-burning vessel of the same size. Fuel oil can be stored in odd spaces of no use for anything else, thus leaving more space for carrying freight. American railways used 44 million barrels of fuel oil in a recent year. Most of the railways in our Southwestern states and in Mexico burn fuel oil in their engines. This is logical, in view of the large production of petroleum in California, Texas, and Mexico and the fact that there is no local coal supply in much of the area.

Kerosene serves remote people. Less than a century ago the kerosene lamp freed the American home from the gloom of candlelight; now electric lighting is widespread, but kerosene has found new uses. As a result the American market consumes even greater quantities than formerly. Kerosene still supplies the light of many rural homes, about a million American families burn kerosene for cooking or heating, and some trucks and tractors use kerosene instead of gasoline for power. Kerosene is highly satisfactory for lights that must burn long without attention, as in light-buoys and for signal lights on branch railways in sparsely settled sections. It also penetrates

into the out-of-the-way places of the world. Put up in tin containers it reaches the tents of the nomads in the Sahara and in remote parts of Asia.

Minor petroleum products. Petroleum yields a long list of minor products. Most oil pools yield gas, and this excellent fuel now can be piped to distant cities. Vaseline and paraffin are by-products of the manufacture of lubricating oils. Certain highly refined oils are used as medicines. The manufacture of automobile tires consumes carbon black. Petroleum coke enters into the manufacture of electric arc-lights. The building of roads, the paving of streets, and roofing annually consume several million tons of asphalt obtained as a by-product in refining certain crude oils.

Four Major Petroleum Areas. The world's demand for petroleum is supplied chiefly from four areas. The western half of North America accounts for 60 per cent of the total. Oil fields are scattered from Alberta to the southern part of Mexico, but the bulk of the output comes from Western United States. The second major petroleum belt extends from the Ural Mountains to the Carpathian Mountains, the Caspian Sea, and the Persian Gulf. In this belt the Soviet Union leads in production, its best-developed fields lying on the flanks of the Caucasus Mountains. This belt also includes fields in Iran, Iraq, and Arabia. The third great petroleum belt lies along the Andes in South America. The output comes mainly from fields near the Caribbean coast—in Venezuela, Colombia, and the island of Trinidad. West of the Andes, deposits of considerable importance extend from the coast of northern Peru into Ecuador, and the eastern flank yields some oil, principally in Argentina. Southeastern Asia, the fourth major source of petroleum, includes fields in India, Burma, Netherlands Indies, and British Borneo.

Oil Fields in the United States. Petroleum lies so well hidden in the earth that the extent and location of the world's resources are not fully known, but our own country has been explored rather thoroughly. Our largest known deposits are in four general areas west of the Mississippi River (Fig. 190). The great fuel-using northeastern quarter of the country contains four oil fields, but production there is relatively small. At present many deposits not known ten years ago are tapped, but most of the discoveries have been made in or near the general areas already known. The Michigan Field is an exception to this fact. All our known resources ex-

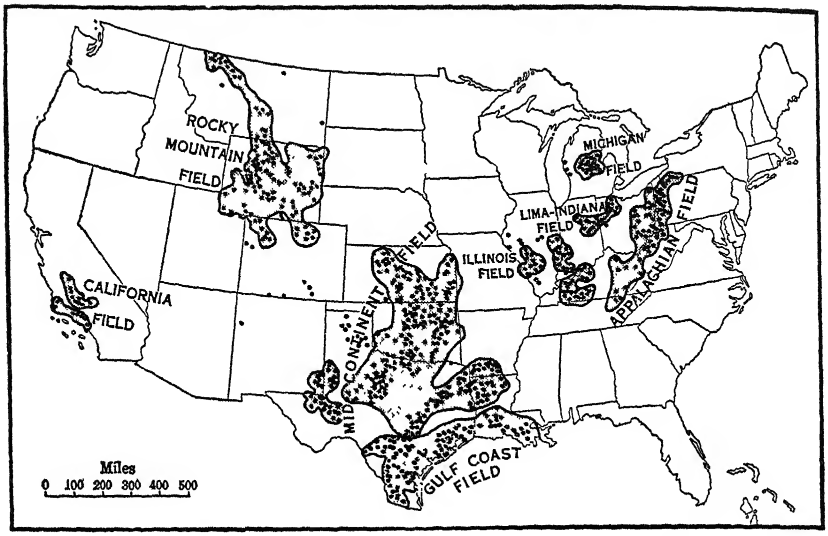


FIG. 190. The principal oil fields of the United States. The dots indicate oil pools

cept the petroleum deposits of the Gulf Coast and California lie in the interior of the continent (Fig. 190).

How Petroleum Is Obtained. Oil is stored in beds of sedimentary rock where large quantities of organic matter accumulated during the formation of the beds and slowly changed to petroleum. Some borings reach beds where the oil is under high pressure, and in such cases a flowing well results, but most oil wells require pumping. The wells vary greatly in depth, according to the position of the oil-bearing beds, or "pools" (Fig. 191). The first American oil well, drilled in Pennsylvania in 1859, was only 69 feet deep. At present Texas oil comes from depths averaging 4000 feet, and a number of wells in the country bring oil from depths of more than two miles.

Deciding Where to Drill. How do men know where to drill for oil? The answer is "They don't," and therefore they make many mistakes. Sometimes the drill is driven down through one bed of rock after another without reaching oil, the result being a "dry hole." Of the 29,000 wells completed in a recent year, more than 6000 were dry holes. New wells within a producing field have fair chances of striking oil; but the search for new deposits is characterized by so many hazards that oil men call it "wildcatting." The underground reservoirs are irregular in extent, and many of them

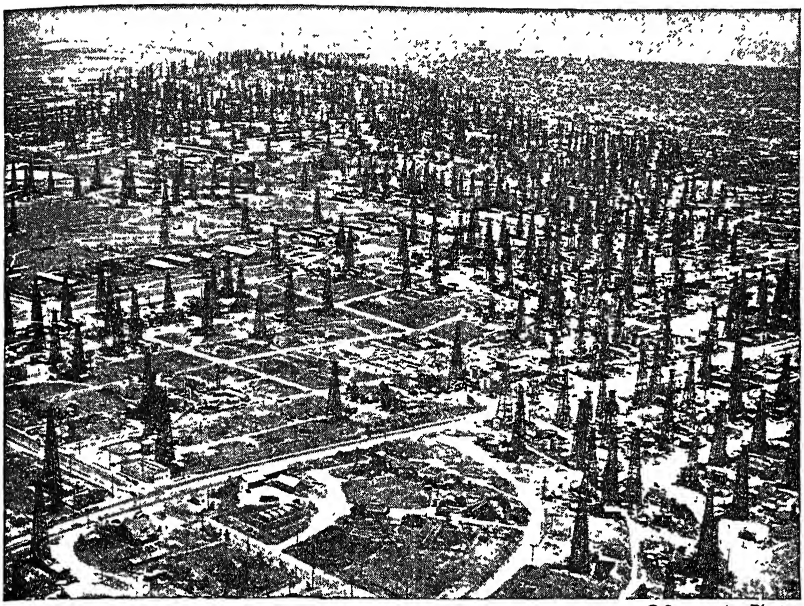


FIG. 191. The Signal Hill oil pool near Long Beach, California. The outer border of derricks outlines the margin of the pool

are small. In some places oil seepages have revealed the location of new pools, and prospectors study the character and structure of the bedrock, searching for irregularities that might hold oil. Electrical apparatus and air photography increase the chance of success, but wildcat drillings still result in many dry holes. A recent survey of 1000 wildcat ventures showed that where the sites had been chosen by scientific methods one drilling out of six struck oil, but in other cases there were seventeen failures for every producing well.

Bringing in a Well. The hazards and excitement of the oil industry are illustrated by the story of the Spindletop gusher, the first sensational oil well of the Gulf Coast Field. The drilling contractors erected their 60-foot derrick on Spindletop Mound, in southeastern Texas, and suspended from the derrick a heavy string of tools and a drill weighing half a ton. They forced the well casing down until, at a depth of 1030 feet, they struck a layer of shell rock which gave much trouble. Repeatedly the drill dropped about 6 inches into a crevice, and though it did not stick fast, it could not be turned either way. After three discouraging days spent in trying to widen the

troublesome crevice, suddenly a great gush of mud, gas, and oil shot out of the hole, carrying with it the drilling tools and 600 feet of 4-inch steel pipe. The torrent tore the top off the derrick and spattered the landscape for miles around with a mixture of mud and oil. The flow continued for a half hour and then stopped. For thirty minutes the well gave indications of failure; then the cover rock above the oil gave way. In the words of the drilling contractor, it "broke loose with a bang . . . and great gobs of mud and rocks started shooting out of the hole with enormous force, then the gas, then the oil. The black stream, flowing in a solid column 6 inches in diameter, gradually got higher and higher, . . . until it was shooting 200 feet into the air." This was the first great gusher struck in the United States, and it "blew wild" for ten days before it could be capped.

Developing a District. After oil is discovered much remains to be done before it can be marketed. Test wells are driven at varying distances from the original well until the boundaries of the pool are established. Generally the oil rights are held by several owners, and formerly the owners engaged in a race for oil, on the principle of "first come, first served." Each owner increased the number of his wells, hoping to pump oil faster than his neighbors. Thus they drew more oil from the earth than consumers needed, involving costly storage, losses from evaporation, and danger of fire. Now there is a growing tendency to treat each pool as a unit, and state and Federal authorities restrict production according to the demand, allotting to each producer a fair share of the total.

A new oil field always attracts people. Villages and even cities develop almost overnight. If a new pool lies near an existing town or city, the place enjoys a boom. Land values rise, and the whole community is thrown into feverish activity. Work in the new field requires steel pipe for well casing, timber for derricks, drilling tools, engines, and miles of steel cable, and the railways leading into the town are congested. Many men seek a fortune in the new El Dorado, and the influx of workmen floods hotels and boarding houses. New streets must be opened, water mains and electric wiring extended, and stores and shops multiplied. A community has to rearrange itself on a much larger scale and must do it in short order. If a pool lies in a wilderness, the difficulties are even greater, for then transportation must be established and a complete community be built. In such cases a new town is added to the map.

Oil for Our Future Needs. Though nobody knows the exact amount of petroleum stored in the rocks of the United States, we do know that the amount stored there cannot be increased. When the present stores are exhausted, we shall have no more. New methods of prospecting and improved drilling machinery have revealed deep deposits not known a decade ago. Even so, our known reserves amount to less than half the total for the world, and we annually take from the earth more than do all other countries together. Moreover, many abandoned oil pools still contain much oil which we have no way of getting. Until recently the methods of production were so poor as to leave in the ground at least three fourths of the oil originally held by the pool. Progress during the last decade enables producers to maintain the pressure in the oil-bearing beds and thus prolong the life of the wells; but we still have much to learn.

We must face the fact that in time our increasing needs and diminishing reserves will create a shortage of petroleum. At present we know of three substitutes to which we may turn. Petroleum products can be derived from oil shale, a rock which is abundant in some of our Western states, but the manufacturing processes are costly. Alcohol distilled from wood or other vegetable matter can be used as a motor fuel. A third substitute is benzol, a by-product of coke-manufacture. As yet no substitute source for lubricants is in sight. Realizing the importance of petroleum, we should welcome every effort of government and industry to conserve our reserves and to prolong the life of producing wells.

Distribution of Refineries. There are about 550 petroleum refineries in the United States and more than 100 in other countries. According to their locations refineries are of three types: field refineries, market refineries, and seaboard refineries. Field refineries profit from a near-by source of crude oil, but in many cases they are handicapped by not finding local markets for all their products. Market refineries, taking advantage of the large demand in the cities for varied petroleum products, have been established near many large cities, both in the United States and abroad. Seaboard refineries have the advantage of access to both foreign and domestic markets.

American refineries, equipped to handle daily more than 4 million barrels of crude oil, if necessary, are distributed irregularly among 32 states. However, five areas contain more than 90 per cent of the total refining capacity. These are (1) the Eastern Seaboard, (2) the

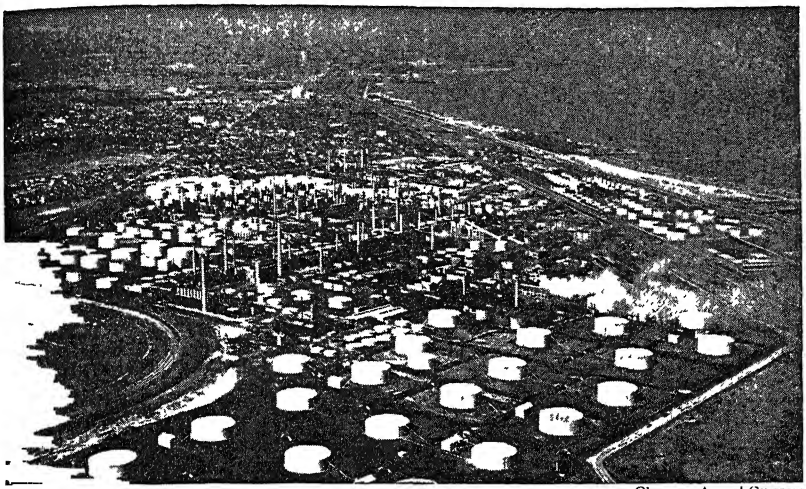
Middle Western section of the Manufacturing Belt, (3) the Mid-Continent and Rocky Mountain oil fields, (4) the Gulf Coast of Louisiana and Texas, and (5) the southern half of California.

Refineries of the Eastern Seaboard. The Eastern Seaboard is the leading petroleum refining section of the United States. The principal refineries occupy water-front sites in the New York, Philadelphia, Boston, and Baltimore areas. They treat crude oil both from American fields and from foreign fields. They are both market and seaboard refineries; for they have access to the largest consuming area of the country, and they ship refinery products to oversea markets. For example, ports of the Eastern Seaboard export larger quantities of lubricants, of paraffin, and of kerosene in containers than do ports in any other section of the country.

Middle Western refineries. The Middle Western group includes both field and market refineries. Field refineries are distributed through the oil-producing areas of Pennsylvania, Ohio, Indiana, Illinois, Kentucky, and Michigan. Many market refineries occupy sites near Chicago, St. Louis, Cleveland, and other major cities (Fig. 192). Their local market includes a large number of filling stations and numerous manufacturing plants. In addition, they are in a position to ship by rail to a large surrounding area.

Mid-Continent and Rocky Mountain refineries. In the Mid-Continent and Rocky Mountain fields many of the field refineries are small plants located in villages or small towns and equipped for only the simpler refining processes. Since there are only a few cities in this part of the country, the local market is not large enough to use all the products of refining. Consequently most of the refineries merely extract the gasoline and kerosene, selling the residue as fuel oil without removing the lubricants and other valuable products. In Tulsa and a few other cities of the Mid-Continent Field, however, there are large plants carrying on all phases of refining.

Gulf Coast and California refineries. Refineries on the Gulf Coast of Louisiana and Texas, as well as those in California, combine the advantages of field and seaboard locations. The equipment of these two areas makes up about half the refining capacity of the country. Gulf Coast refineries treat crude oil from the Gulf Coast and Mid-Continent fields. A considerable part of their output is sold to bunkering stations for steamship fuel. The California refineries take care of the enormous output from the California Field and have a large local



Chicago Aerial Survey

FIG. 192. A market refinery at Whiting, Indiana, a suburb of Chicago

market for railway, industrial, and domestic fuel. In addition, the California refineries are well placed for transpacific shipments. Interestingly enough, the refineries in Los Angeles represent all three classes of location. They are field refineries, for oil is produced within the city limits; they are market refineries, for Los Angeles is an important metropolitan area; and they are seaboard refineries, for the city is a port.

The Oil Trade. Petroleum enters into commerce both in its crude form and in the form of petroleum products. In the first division of the trade, crude oil is sold to refiners and moves to manufacturing centers. The second division supplies widely scattered consumers with kerosene, gasoline, lubricants, and other refinery products. So far as the United States is concerned, both divisions belong chiefly to our domestic trade, but both also involve trade with foreign countries.

Areas interested in the oil trade. The petroleum trade concerns a few great areas in a large way, but some petroleum products go to every country of the Commercial World. Western Europe imports the largest amounts; for that region, rich in many resources, has only meager deposits of petroleum. Eastern Asia is a market of growing importance, and Canada buys large quantities of crude oil. The greater part of the world's export oil originates in Middle America, in the United States, and in Southwestern and Southeastern Asia. In the Soviet Union, as in the United States, most of

the output goes to domestic consumers. Field refineries are operated in the major foreign petroleum areas, as well as in the United States, and thus both crude and refined oils are included among the shipments from each exporting area.

Movement of crude oil in the United States. The greater part of the petroleum produced in the United States moves to refineries by pipe line or in tank ships, but lesser quantities are hauled in tank cars and trucks. For the transportation of crude oil, American companies operate nearly 100,000 miles of pipe line. Within the producing fields the oil is pumped through gathering lines that connect individual wells with trunk lines leading to the refineries. In the trunk lines the oil from many wells is forced along by pumps placed at intervals of from 30 to 40 miles.

To a large extent, movements of crude oil focus on the three seaboard refining areas. East of the Rockies pipe-line systems connect all producing fields with refining centers, and similar systems lead from California fields to Los Angeles and San Francisco. The pipe-line systems that supply the Gulf Coast and California refineries are connected also with ocean terminals, where tank ships load oil for Eastern Seaboard refineries or for export.

Domestic trade in refinery products. Our domestic trade in refinery products is very large; for refineries in the United States treat more than half the crude oil produced in the world and sell the larger part of their output in domestic markets. The demand varies from one section to another, the densely peopled northeastern section being the principal market area. For example, the states from Minnesota and Missouri to the Atlantic, with their large registrations of motor vehicles, use more than half the gasoline consumed in the country. Furthermore, the varied industries of this section call for practically all refinery products. The Southern states, from Texas and Oklahoma eastward, take nearly a fourth of the gasoline used in the country, Texas being the largest consumer in the South. The sparsely peopled Western states have relatively small petroleum needs, but California uses nearly as much gasoline as New York, and the Western railways consume large quantities of fuel oil. For example, one of the fast streamline trains burns nearly 200 barrels of oil on each run between Chicago and Los Angeles.

Transportation of refinery products. Railways, trucks, and tankers handle most of the business of transporting refinery products. In

the Southeast, however, large quantities are hauled inland by river barges, and refiners have begun delivering gasoline by special pipe lines to wholesale distributing centers. The distribution of existing gasoline lines emphasizes the importance of the Middle West as a market and points to competition among refining areas. Gasoline lines have been laid from Mid-Continent refineries to points as far north and east as Minneapolis, Chicago, and Indianapolis, and Eastern Seaboard companies have extended their lines across the Appalachian Highland to Pittsburgh, Buffalo, and Cleveland. Thus manufacturers in three of the major refining areas compete for the trade of Middle Western automobile-owners.

Our foreign trade in oil. The United States is both an exporter and an importer of petroleum. We import oil from only a few areas, but our exports go to many lands. The distribution of the trade emphasizes the importance of our relations with our neighbors on the north and south, with Western Europe, and with Eastern Asia.

The United States imports of foreign oil are small in comparison with the domestic production. They consist almost wholly of crude petroleum and fuel oil from Middle American fields and enter the country chiefly through ports of the Eastern Seaboard. More than half the imported fuel oil is delivered at the port of New York for bunkering ships, a fact reflecting the abundance of shipping services at our leading port.

Though domestic markets take more than 80 per cent of the output of our oil fields, the United States ranks as a major petroleum-exporting country. Crude oil goes to foreign markets in somewhat smaller quantities than refinery products, but the proportion of crude oil in our petroleum exports has increased in recent years. This change reflects the recent establishment of up-to-date refineries in important consuming countries. Canada takes more than half our crude-oil exports, and most of the rest goes to Japan and France. Gulf Coast and California ports ship most of the crude oil, but considerable quantities go to Canadian refineries by land routes from inland oil fields.

Exports of refinery products go to many countries. About four fifths of the total volume goes to Western Europe, Eastern Asia, Tropical America, and Australasia, the largest customers being Japan, Great Britain, and Germany. The fuel stations scattered along the great ocean highways together make up an important market for petroleum

products. In fact, refinery products from the United States are shipped to more than 100 countries. Since lubricants are needed wherever people use machinery, American-made lubricants have the widest distribution of all petroleum products.

Transporting oil by sea. The large oversea trade in petroleum and petroleum products led to the construction of special ships to carry these inflammable liquids. Both for the sake of safety and for the purpose of carrying a mixed cargo, tankers are sometimes divided into as many as twenty-four separate compartments. Tankers make good speed on the sea, and they load and discharge their cargoes rapidly by pumping the oil through pipes. The American tanker fleet has done much to extend the commerce in petroleum products, and its ships carry our flag into every important port in the world.

QUESTIONS

A. *Oil fields and refineries of the United States* (*Fig. 190*)

1. Which fields are conveniently placed for supplying our principal cities (Fig. 68 and Plate II)?
2. Which are in areas not producing much coal (Fig. 175)?
3. Which fields are on the coast? In what ways is a coastal position advantageous?
4. Which field lies in an area without many lines of transportation (Figs. 89, 90, and 91)? Why are there few railways in that part of the country?
5. What happens when oil is discovered in a new area?
6. How does the number of petroleum refineries in the United States compare with the total of all other countries?
7. What are the three types of petroleum refineries on the basis of location? State the distribution of each type in the United States.

B. *Technique of the petroleum industry*

1. How is the search for new oil fields carried on?
2. How is an oil well drilled?
3. How is crude oil transported to the refineries?
4. How is crude oil refined?
5. How are petroleum products stored at the refineries?
6. How are petroleum products transported on land? on sea?

EXERCISES

1. *Major areas producing petroleum*

Shade in black or red on an outline map the principal petroleum-producing areas of the world. (See this chapter and Figure 27.)

2. *How a community is supplied with petroleum products (based on a study of your own community)*

Make a map of your town or of several blocks of your city, showing the location of service stations. Then answer the following questions:

a. Why are the service stations where they are? (Consider their relation to the principal streets, to the state and Federal highways, to the center of business in town, to areas where many cars are parked every day, and to position in the block in which they are located.)

b. Who supplies the service stations with gas and oil?

c. How are the gas and oil brought to the station? How often?

d. Where does the gas and oil sold to the service stations come from?

e. On which day of the week are the stations busiest? Why?

CHAPTER XXIV

THE AUTOMOBILE IN A LAND OF GREAT DISTANCES AND GREAT RESOURCES

> Of all inventions, the alphabet and the printing press alone excepted, those inventions which abridge distance have done most for the civilization of our species.—MACAULAY

In 1900 Detroit, then a city of 286,000 inhabitants, was concerned primarily with the commercial needs of Michigan and with transportation on the Great Lakes. Although it was a manufacturing center of some importance, only its most optimistic citizens predicted for it a great industrial future. By 1930 it had 1,500,000 inhabitants, and the term "f.o.b. Detroit" was known round the world.

The reason for Detroit's rapid growth may be seen on every highway in the land. In 1900 there were more than 900,000 carriages and buggies manufactured in the United States and less than 4000 automobiles. By 1939 the output of motor vehicles was more than 4,000,000 and the horse-drawn carriage had become a real curiosity. In the meantime not only had a new type of highway appeared in the landscape, but the United States had changed from a country of poor roads to a nation with an efficient system of well-built highways. Detroit and the other automobile-manufacturing centers had grown accordingly.

The Motor Industry. When once the automobile had demonstrated its worth, a large number of companies put cars on the market. Gradually, however, it became apparent that the successful manufacturer would profit by a nation-wide rather than a local business. This called for big companies; and now the industry is made up of a few great organizations actively competing for the nation's business.

Each of the motor companies designs, manufactures, and distributes cars. The manufacturing is carried on in a relatively few huge plants,—plants which are models of order and arrangement. In these plants the engines and many other parts of the cars are made; but, in addition, the motor companies depend on other manufacturers for bodies, and for some of the materials and parts which go into the finished cars. One of the great companies, for example, buys parts, machinery, tools, and equipment from approximately 5000 other

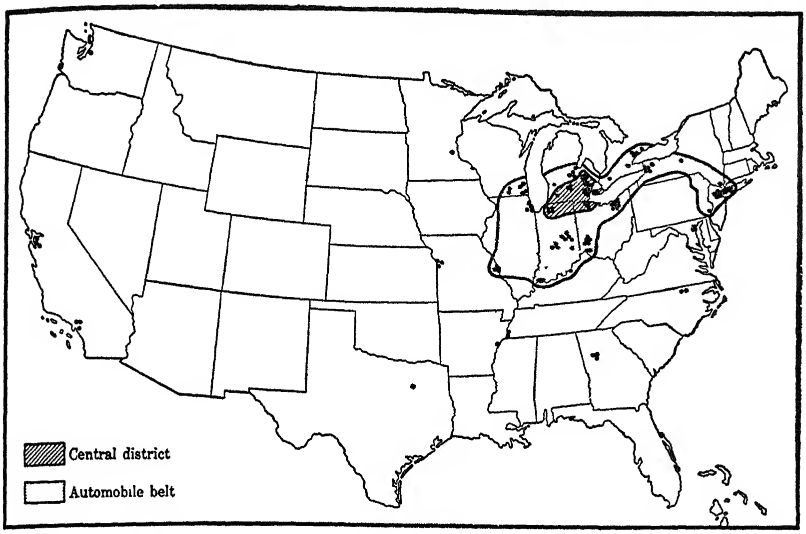


FIG. 193. The Automobile Belt and its Central District. Each dot within the belt represents the head office of a company manufacturing some form of motor vehicle or a subsidiary plant of one of the big motor companies. The dots outside the belt indicate assembly plants or plants manufacturing automobile bodies

firms. In addition to their central factories, the major companies have assembly plants in distant sections of the country. To these plants the engines, bodies, and parts are shipped in carload lots from the parent plants, thus making a saving in transportation. In some cases a body plant is operated in the same city as the assembly plant. From the parent plants and the assembly plants the finished cars are distributed to dealers in this country and many foreign countries.

The Automobile Belt. In large measure the manufacture of automobiles is confined to an irregular belt in the northeastern quarter of the country (Fig. 193). Within this belt are located the offices and factories of nearly all the firms manufacturing passenger cars, trucks, busses, and taxicabs. In addition, most (but not all) of the parts and accessories are made in this belt. The extremes of the belt lie at St. Louis on the west and New York City on the east. Detroit lies near the center, where manufacturing activity is most intense. Our concept of the Automobile Belt will be more accurate if we recognize a Central District covering southeastern Michigan, northwestern Ohio, and northeastern Indiana. This Central District contains at least 85 per cent of the industry.

Advantages of Central District in Early Days of Industry. It is logical, of course, that the automobile industry should have developed within the major manufacturing belt of the country. The world has been puzzled, however, by the fact that the new industry grew up west of the Appalachians instead of in the older manufacturing area on the Atlantic Coast. This fact is explained by the definite advantages possessed by Detroit and other points in and near the Central District. Automobile manufacture was attempted in the East as early as in the Middle West. Between 1902 and 1913 many factories were opened in Southern New England, only to be abandoned after a short period of unprofitable operation. In the same period the advantages of the Central District made themselves felt; for automobile manufacture gained a firm foothold in Michigan, Ohio, and Indiana.

Relation to industries already established. The success of automobile manufacture in the Middle West was furthered by industries already established there. In 1900 both carriage and motorboat manufacturing were important industries of the states bordering Lake Erie and Lake Michigan. At that time Michigan, Ohio, and Indiana were producing more than 60 per cent of the carriages made in the United States. This was in harmony, on one hand, with a position near the forests yielding hardwood timber for carriage construction and, on the other, with the large demand for vehicles in the broad expanses of the fertile Middle West. At that time also, Michigan, Ohio, Illinois, and Wisconsin led in the building of motorboats. This leadership was in accord with the long lake-shore line of these states and with the vast number of small lakes scattered over their surface.

Automobile manufacture drew much help at first from the two industries mentioned above, for the early "horseless carriages" were made by adapting the gasoline engine to propel a carriage instead of a boat. Since both carriages and gasoline engines were manufactured in Detroit and other near-by Middle Western points, the pioneer designers of automobiles could have their two major essentials—an engine and a body—built to order in local factories. Automobile bodies are said to have been produced in Michigan at that time for 60 per cent of what they cost in the seaboard states. It is significant that the leading carriage-manufacturing cities in Michigan have become important centers of the automobile industry.

In addition to the major requirements of the industry, Detroit factories turned out the malleable iron, pressed steel, springs, brass

parts, and paint and varnish required for automobiles. When aluminum came into use, the manufacture of aluminum castings was undertaken there. It should be understood that most of these advantages were present also in Cleveland, Toledo, and other cities in the Central District. The advantages prevailed in an area rather than at a single point.

Pioneers trained in other transportation industries. The vehicle, boatbuilding, and gasoline-engine industries made a contribution of men as well as materials to the automobile industry. Biographies of the pioneer automobile-designers show that almost to a man their interest in the automobile grew out of their experience in some other phase of transportation. Several had worked for a time in the motorboat industry, and a number had designed motorboat engines; others had served an apprenticeship in a carriage or bicycle factory. Experience in the boat and vehicle industries gave these men the technical knowledge demanded in the construction of automobiles. It also gave them an insight into the problems of transportation and an interest in the solution of these problems.

Labor available in the Central District. The early growth of the automobile fitted well into the labor situation existing in the Central District. The bicycle, extensively manufactured in this area, had passed its peak of favor. As production declined, men trained in the use of tools and machines were released for the automobile factories. At the outset Detroit and the other centers also drew laborers in great numbers from "upstate." Michigan's lumber industry was declining; and as the sawmills closed, many of the men took jobs in the factory towns. These men were experienced in mill routine and easily fitted into their new tasks. Men came from rural sections also; for in much of Michigan agriculture was not in a prosperous condition, and the rural villages were overpopulated. Probably every village in the state furnished its quota of men to the automobile factories. Later, workmen from other parts of the country and immigrants from Europe flocked to the motor cities.

Roads favored the use of cars. Conditions for making use of the new vehicle were more satisfactory in and near the Automobile Belt than in many parts of the country. In 1900 most of our country roads were poor, and in many areas they were impassable during wet weather. The northern states from Minnesota to New England, however, possessing abundant supplies of gravel, had fairly good

Materials	Tons	Per Cent of United States Production Consumed by the Automobile Industry	Leading Areas of Production
Steel	6,500,000	20.3	Pittsburgh, Chicago, and Cleveland districts
Copper (refined) . .	138,000	18.4	New Jersey, Arizona, Maryland, Montana, Michigan
Lead	217,000	34.3	California, Nebraska, Utah, Missouri, Illinois[1]
Zinc	69,000	11.8	Pennsylvania, Illinois, Oklahoma, West Virginia[1]
Aluminum	23,400	13.4	Wisconsin, New York, Ohio, Michigan
Tin	11,000	11.8	New York, New Jersey, Pennsylvania
Nickel	10,500	29.7	Ontario, Canada (refining plant at Port Colbourne)
Rubber (crude) . . .	459,000	80.0	Akron (Ohio)
Hair and padding . .	29,225	——	California, Louisiana, Michigan, Pennsylvania
	Square Feet		
Plate glass	145,420,000	73	Pennsylvania, West Virginia, Indiana, Ohio
Upholstery leather . .	20,214,000	46	New Jersey, Ohio
	Board Feet		
Hardwood lumber[2] . .	208,000,000	5.5	Louisiana, Arkansas, Michigan, Tennessee, Wisconsin, West Virginia
Softwood lumber . .	185,000,000	——	Washington, Oregon, Louisiana, Mississippi
	Yards		
Upholstery cloth . .	52,220,000	——	
	Gallons		
Paint and lacquer . .	17,816,000	——	New York, Illinois, Ohio, Pennsylvania, New Jersey, Michigan
	Bales	Per Cent of Bales Consumed in United States Mills	
Cotton	632,240	9	United States Cotton Belt, Egypt, Peru

FIG. 194. Volume and origin of the materials used in the manufacture of motor vehicles in a representative year. The table also shows the relation of the amount used in the automobile industry to the total production in the country

country roads. This gravel is a heritage from the last great ice sheet which, in ages past, covered the Northern states. In 1904 the Lake States had nearly half the mileage of surfaced roads in the country. In addition, the Middle West has the advantage of long stretches of level country—a condition of no mean importance in the days when every hill was a hazard to the motor engine.

Capital available. When once success was demonstrated, the industry developed rapidly. Capital, hesitant at the outset, was lured to the industry by the great profits made in certain of the pioneer establishments. Capital in the East was occupied profitably with the textile, machinery, and other lines of manufacture already localized there, and perhaps was hesitant about venturing into an untried field. Capital in the Middle West was not as definitely employed, and took the risk. In a remarkably short time the industry entrenched itself in Detroit and other points in the Central District.

Present-Day Advantages of the Central District. In spite of the many changes which have come since the beginning of the automobile industry, the Middle West retains its leadership. Some of the early advantages have lost their significance, but others have increased in importance. Present-day advantages include superior opportunities for securing raw materials and for marketing the finished vehicles.

A central position aids in assembling raw materials. The Central District is well located for assembling the principal materials used in manufacturing automobiles (Fig. 194). When automobile manufacturers buy steel in lots of 5000 tons or more, as they frequently do, freight charges form a big item and distance from the steel mills becomes an important consideration. It is significant, therefore, that the Central District is fringed by the Pittsburgh, Lake Erie, and Chicago steel-producing districts. Michigan still produces considerable quantities of the hardwood required; most of the plate glass produced in this country comes from western Pennsylvania and eastern Ohio; and Akron, Ohio, is the center of rubber manufacture. Furthermore, the motor cities are within short reach of plants producing copper, nickel, lead, zinc, and aluminum. Coal for power is readily available

[1] (Fig. 194 *continued*) New York City and St. Louis are the major two markets for lead in the United States. Prices are based on quotations in these market centers.

[2] The vehicle industry uses hickory, ash, and oak principally.

in the Northern Appalachian, the Middle Appalachian, and the Illinois-Indiana fields (Figs. 193 and 175).

A central position aids in distributing output. The Central District has a favorable position for delivering finished vehicles to purchasers. It is centrally placed with reference to the principal market areas. The distribution of motor vehicles in the United States resembles rather closely the distribution of population (Fig. 67). The great purchasing area is the densely peopled northeastern quarter of the country, and in this area are two important market regions—the Middle West and the Eastern Seaboard. The Central District, with its greatest manufacturing activity concentrated in and near Detroit, occupies a central position with reference to these two regions. It has the advantage of access to adequate transportation facilities. It is crossed by several of the Eastern trunk lines. In addition, because of its relation to Chicago, St. Louis, and other railway centers of the Middle West, it has direct contact with lines leading to the southern and western parts of the country (Plate II).

The American Automobile Abroad. The United States makes more automobiles, uses more automobiles, and exports more automobiles than all other countries combined. More than 80 per cent of the motor vehicles in the world are made in the United States and Canada, and about 70 per cent of them are in use in these two countries. Though the domestic market takes most of the output of the automobile factories, the motor vehicle has become a big item of export (Fig. 30). American automobiles, in fact, are in service in practically all parts of the Commercial World. We have an increasing export even to Western Europe, the only other region in which automobile-manufacturing is well developed. In recent years Japan has bought many motor trucks. Our most promising market, however, is in newly settled countries where distances are long and people are prosperous. Thus, the Union of South Africa, Australia, Argentina, and Brazil are important markets. In these and other markets several of the American manufacturers have opened sales offices and assembling plants and are making other efforts to increase their foreign sales.

Conditions Favoring the United States in the Export Trade. The pre-eminence of the United States in the oversea trade in motor vehicles is due to the low cost and sturdy nature of our cars. The low cost grows out of the fact that the United States has the largest

domestic market. No other manufacturing country has as large a population, and no other country has as many people financially able to buy automobiles. In the United States there is, on the average, one automobile for every 5 people; in France, one for every 19; in Great Britain, one for every 26; and in Germany, one for every 49. As a result American concerns do a large volume of business; and this advantage, combined with abundant raw materials, means that cars are produced here at a lower cost than abroad. The sturdy construction of American automobiles grows out of the fact that our cars are built to stand up under all sorts of road conditions, whereas the European cars are, on the whole, designed for use on improved highways. This means that American cars are well adapted for use in countries like Argentina and Australia, where as yet there are few good roads.

QUESTIONS

1. Why was Michigan an important carriage-manufacturing state in 1900? Why was it a leading motorboat-manufacturing state?

2. Why was there a surplus of labor in Michigan at the time when automobile-manufacturing began?

3. What types of manufacturing of importance in the "horseless carriage" stage of the automobile industry were carried on in Detroit at that time?

4. If you were manufacturing a product which you wished to sell to every person in the United States, in terms of transportation what section of the country would be the best location for your plant?

5. Why is it advantageous for automobile-manufacturers to be located near the steel-manufacturing districts? the districts making plate glass? the coal-mining districts?

6. What position does the United States hold in the international trade in automobiles? Explain.

EXERCISES

1. *Materials for automobile manufacture*

Prepare a list of the materials for automobile-manufacturing produced in your state.

2. *Terms introduced by the automobile and the modern highway*

1. Why has the French word *detour* come into common use in this country? Write the story of some personal experience which this word recalls.

2. Prepare a list of other highway terms in common use in this country. Group the terms under three headings: (1) facilities along our highways (cabin camp etc.); (2) parts of the roadway (guardrail etc.); (3) highway signs —a new type of universal language ("steep hill" etc.).

3. *Distribution of automobiles by states*

Plot on an outline map of the United States the number of automobiles registered in each state (see *Yearbook of the Department of Agriculture*). Color in dark red the states having the largest number of automobiles, in orange those having a medium number, and in yellow those having the fewest cars. Compare your map with Figures 67, 78, 69, and 74 and then state in writing the relation of the number of cars (1) to density of population, (2) to the major manufacturing belt, (3) to the Great Plains, and (4) to the land in harvested crops in our Pacific states.

CHAPTER XXV

THE EASTERN SEABOARD

A Densely Peopled Region. Suppose some morning you took off in an airplane from Washington, D. C., and headed for Boston. During the course of your 400-mile flight you would view, if the day were clear, the homes, farms, factories, and workshops of almost a fifth of the population of this country. You would view eleven of our largest fifty cities and, upon arrival in Boston, would have traversed the Eastern Seaboard, the most densely peopled region in the Western World (Fig. 67).

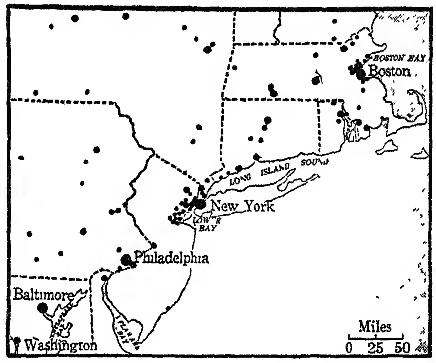


FIG. 195. Major cities of the Eastern Seaboard. Dots represent cities of 30,000 population or more

Cities and waterways form conspicuous features in the landscape of the Eastern Seaboard (Fig. 195). First you would see Baltimore, at the head of Chesapeake Bay; and then Philadelphia and several lesser cities along the Delaware River (Figs. 196–197). At the halfway point New York and its numerous suburbs spread over the islands and peninsulas at the mouth of the Hudson (Fig. 198). Here is the greatest group of closely spaced urban communities in the country. Beyond lie the manufacturing towns of the Connecticut Valley, and another group clusters about Narragansett Bay. Finally, at the head of Massachusetts Bay you would come to Boston and the numerous cities closely spaced about it (Fig. 199).

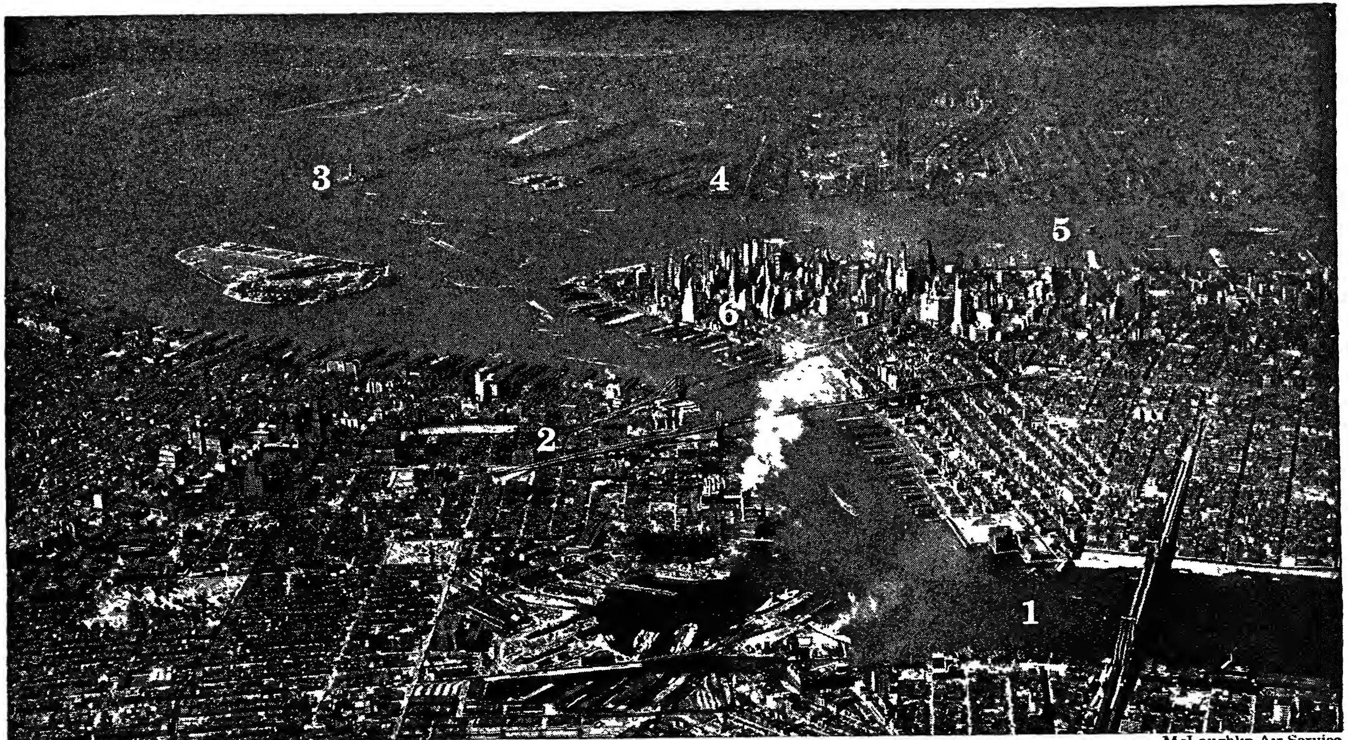
Occupations of the Eastern Seaboard. Practically all human occupations are represented in the densely peopled seaboard region, but the outstanding occupations are manufacturing and trade. Both depend upon transportation, and thus the three activities—manufacturing, trade, and transportation—command the attention and effort of the major proportion of the people of the area. These activities give rise to many cities; and the cities, in their turn, give employment to large numbers of people in construction, in the professions, and in all the varied activities associated with urban life. As markets for farm

Fairchild Aerial Surveys, Inc.

FIG. 106. Airplane view of Baltimore, showing the central business district and part of the port

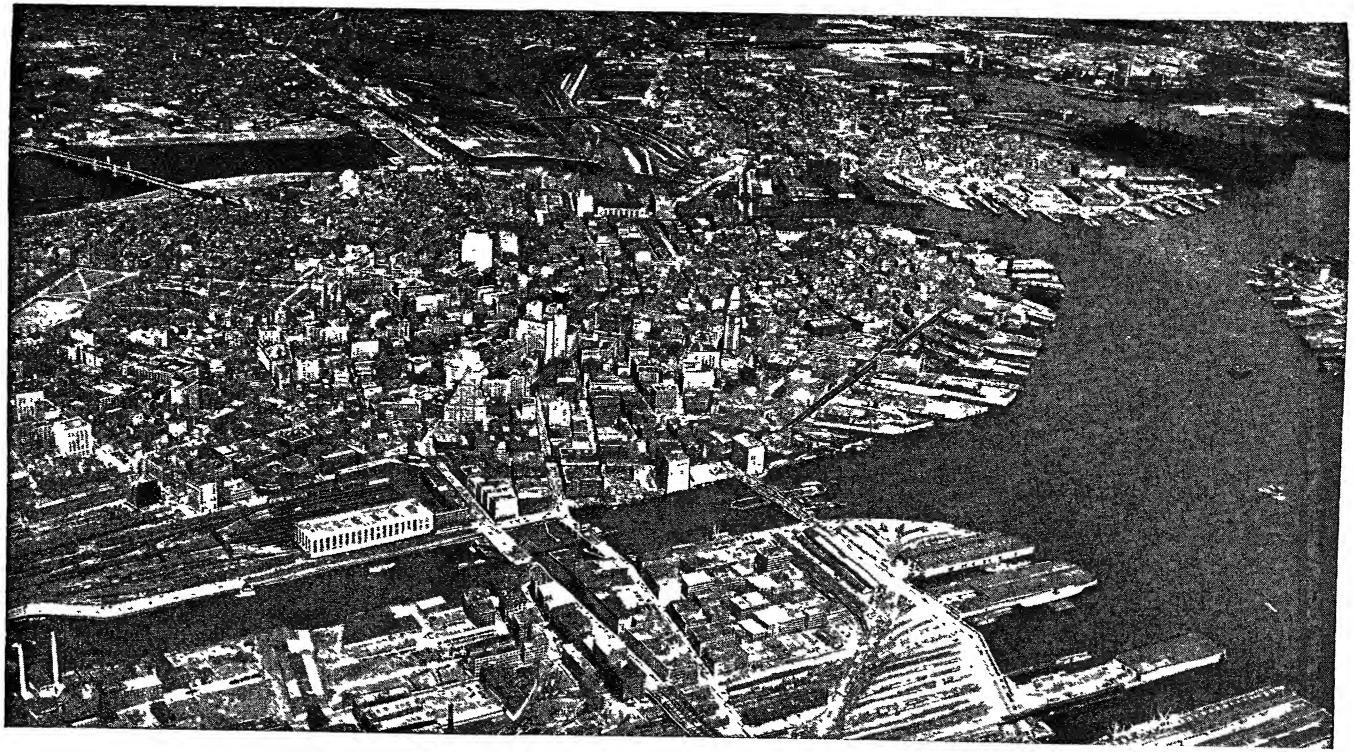
Fairchild Aerial Surveys, Inc.

FIG. 197. Airplane view of Philadelphia, with the Delaware river and Camden in the background



McLaughlin Air Service

FIG. 198. Airplane view of New York showing: 1, East River; 2, Brooklyn; 3, Statue of Liberty; 4, Jersey City; 5, Hudson River; 6, Financial District. The Central Retail District is off the view to the right. See Figure 203



Fairchild Aerial Surveys, Inc.

FIG. 199. Looking north over Boston, with Boston proper in the center, the harbor at the right, and Cambridge and Charlestown in the background

products, the cities stimulate agriculture both in near-by areas and in more distant agricultural areas.

Land and Sea Routes Converge at the Major Cities. Land and sea transportation meet at the great cities of the Eastern Seaboard. A closely meshed web of roads and railroads is spread throughout the area, its principal arteries converging on the major cities, namely, Baltimore, Philadelphia, New York, and Boston. Since each of these cities is on an arm of the ocean, sea routes as well as land routes converge on them. Both land and sea routes handle an enormous volume of goods and a great number of passengers. The cities are the points where goods and passengers are transferred from one means of transportation to another (Figs. 90, 91, 95, and Plate II).

Railway connections. The Eastern Seaboard, with its numerous railway connections to the interior, constitutes the Atlantic frontage of a huge section of the country. These railroads serve important agricultural sections of the country and also our principal coal-mining and manufacturing areas. The Eastern Seaboard owes much of its importance to its position where this great transportation web reaches the sea (Fig. 89). In addition to its westward connections, the Eastern Seaboard has good railway services to the south and north.

Coastwise and intercoastal shipping. Many steamship lines run from one part of the Atlantic Coast to another and from our Atlantic ports to our Gulf and Pacific ports. In a recent year, for example, 28 lines operated between New York and other Atlantic and Gulf ports, and 12 lines maintained services from New York to our Pacific Coast. Most of these lines also offered services from the other ports in the Eastern Seaboard.

Oversea services. The trade of the Eastern Seaboard and the vast area tributary to it attracts ships from all parts of the Commercial World. Recently there were 114 steamship lines in operation between New York and oversea regions. Many of these also offer services from Boston, Philadelphia, and Baltimore. The ports of the Eastern Seaboard are our nearest ports to Europe (Figs. 28 and 200) and handle the bulk of our European trade. Regular services are maintained to the Mediterranean and through Suez to the Orient. The ports of the Eastern Seaboard are our principal points of contact with the east coast of South America and with West and South Africa. The distance to these South Atlantic areas is practically the same from our Eastern and Southern ports. What the Eastern ports lose in being

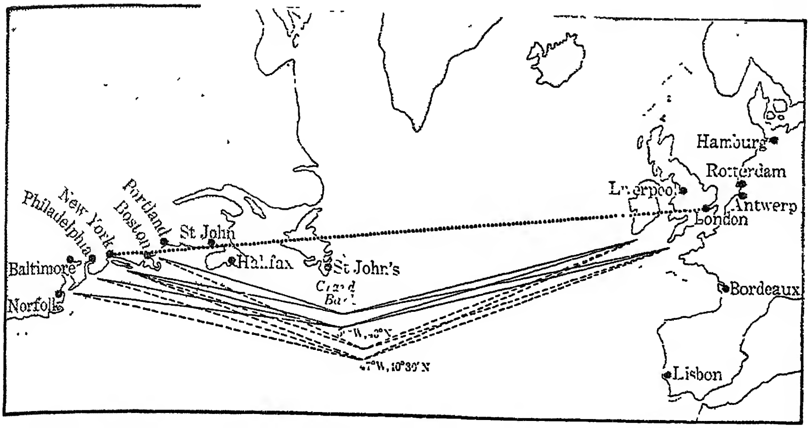


Fig. 200. The North Atlantic Trade Route. The dotted line shows the shortest line between New York and London. The solid lines show the lanes followed by shipping in winter, the broken lines the summer lanes. Ships go many miles out of their way to avoid the fogs and icebergs of the Grand Bank

farther north they make up in being farther east. Thus Rio de Janeiro is 4778 miles from New York as against 5218 miles from New Orleans. Our Eastern ports also have regular services to Gulf and Caribbean points, and by way of the Panama Canal to the west coast of South America and across the Pacific to Eastern Asia, India, and Australia.

A Region of Trade. The Eastern Seaboard is one of the principal trading areas of the world. In volume and variety of goods handled, it ranks with the great commercial areas bordering the English Channel and the North Sea. There is a large exchange of goods between different parts of the region, between the Eastern Seaboard and other parts of the country, and with foreign lands.

Trade within the region. The trade within the Eastern Seaboard itself is enormous. For example, although we have no means of measuring it, the traffic between New York and Philadelphia or Boston undoubtedly is greater than that between many countries. The rural districts and the smaller cities market many of their products in the metropolitan centers, and in turn the factories and trading agencies of the major cities supply the outlying areas with a great variety of goods.

Trade with other parts of the country. Every part of the country uses articles produced in the factories of the Eastern Seaboard. Con-

versely, practically all parts of the country find in the Eastern Seaboard a rich market for their products. Most of these goods move by rail, but large quantities are carried by the ships plying our coastal waters. From our Gulf ports, for example, lumber, raw cotton, and petroleum are shipped to the ports of the Eastern Seaboard, whereas iron and steel goods, heavy hardware, newsprint paper, and a wide variety of other goods make up the return cargoes. Since the opening of the Panama Canal, moreover, a large water-borne trade has developed between our east and west coasts.

The place of the Eastern Seaboard in oversea trade. About half our foreign trade moves through the four great ports of the Eastern Seaboard. They export large quantities of goods produced in the Eastern Seaboard itself and also huge quantities from other parts of the country. Likewise, a large part of the goods we buy overseas reaches us through these eastern ports. With their busy docks, their great warehouses, and their world-wide steamship services they perform a national function. They lie between our country and the major regions with which we trade, and they profit amazingly thereby.

A Manufacturing Region. The Eastern Seaboard is as outstanding in manufacturing as it is in trade. This densely peopled seaboard area is the leading section of the American Manufacturing Belt (Fig. 78). Its factories employ about 40 per cent of all the people engaged in manufacturing in the United States. Manufacturing in America began in this area, and today some of the seaboard cities are so intimately associated with their leading industries that we seldom think of the city without the industry, or the industry without the city. Thus Brockton and shoes, Paterson and silk, Troy and collars, Trenton and pottery, usually go together in our thinking.

Distribution of manufacturing. Much of the manufacturing in the Eastern Seaboard takes place in or about the four great cities. New York City, together with its numerous suburbs, makes up a highly diversified manufacturing district. Philadelphia, not without cause, advertises itself as "the world's greatest workshop." Boston is the center of a closely spaced manufacturing district. Baltimore also is one of our leading manufacturing centers. In addition to these metropolitan districts, there are highly developed manufacturing districts in Eastern Pennsylvania (pp. 320–321), in the Mohawk Valley of New York, and in Southern New England (Figs. 78 and 165).

Group I *Things to wear*	1. Men's and women's clothing, with such associated lines as fur goods, haberdashery, millinery, hats and caps, hosiery, knit goods, and jewelry 2. Boots and shoes; leather goods 3. Textiles: silk, woolen, and cotton goods
Group II *Things to eat*	1. Meat and meat products 2. Refined sugar 3. Cocoa, chocolate, and confectionery 4. Canned goods 5. Bread and bakery products
Group III *Things with which to build and to furnish buildings*	1. Structural iron and steel 2. Brick, tile, and pottery 3. Concrete 4. Tinware, stamped and enameled ware, hardware 5. Electrical supplies
Group IV *Transportation materials*	1. Steel rails 2. Locomotives 3. Streetcars 4. Automobiles, parts and accessories
Group V *Machinery*	1. Factory machinery, including textile, boot and shoe, and a great variety of machines for other types of manufacturing
Group VI *Articles of special utility and luxury*	1. Chemicals, dyes, and drugs 2. Tobacco manufactures 3. Sewing machines 4. Radio outfits, talking machines, musical instruments 5. Petroleum products
Group VII *Articles or materials to be used by other manufacturers*	1. Iron and steel 2. Copper, lead, and zinc 3. Heavy chemicals

Fig. 201. Principal products manufactured in the Eastern Seaboard

Character of manufacturing. Manufacturing in the Eastern Seaboard is characterized by its diversity; in fact, one scarcely can name a manufactured article not produced in this area. No brief list can show adequately the diversity of the output of the mills and factories of the Eastern Seaboard. Some of the products, however, appear in Figure 201. The industries supplying these products are note-

Boston	New York	Philadelphia
Lynn	Yonkers, N. Y.	Camden, N. J.
Salem	New Rochelle, N. Y.	Trenton, N. J.
Chelsea	Mount Vernon, N. Y.	Wilmington, Del.
Everett	Bridgeport, Conn.	Chester, Penn.
Somerville	Stamford, Conn.	Norristown, Penn.
Cambridge	Jersey City, N. J.	
Medford	Hoboken, N. J.	
Lawrence	Bayonne, N. J.	
Lowell	Newark, N. J.	
Waltham	Elizabeth, N. J.	
Newton	Union City, N. J.	
Brockton	New Brunswick, N. J.	
Quincy	East Orange, N. J.	
Malden	Irvington, N. J.	
Brookline	Passaic, N. J.	
	Paterson, N. J.	

FIG. 202. Larger suburbs and satellites of Boston, New York, and Philadelphia

worthy for the number of workers they employ and for the value of their output. The clothing, textile, leather, boot and shoe, machinery, hardware, and electrical-supply industries are particularly characteristic of the region.

Agriculture of the Eastern Seaboard. The farming sections of the Eastern Seaboard possess the advantage of being near one or more metropolitan areas. As a rule, therefore, the seaboard farmers can place their products in these city markets in less time, in better condition, and at less cost than farmers at a greater distance. This advantage applies particularly to such perishables as fruits, vegetables, poultry, eggs, and dairy products; and the farmers, in large measure, specialize in these products. In a general way horticulture predominates in the area east of a line drawn from Washington through Baltimore, Philadelphia, and New York to Boston. West and north of the line more attention is given to dairying (Figs. 109 and 149).

Fisheries of the Eastern Seaboard. The cities of the Eastern Seaboard, particularly Boston and Baltimore, take high rank for their fisheries. In large measure this rank is due (1) to the fine fishing grounds in the bays along the coast and on the offshore banks, (2) to the large demand for fish in New York, Philadelphia, and the other cities of the seaboard area, and (3) to the distribution of fish by rail from the seaboard cities to points in the interior of the country. Boston handles large quantities of both fresh and salt cod,

mackerel, herring, and other fish caught along the shore and on the offshore banks. Baltimore long has been the leading center for the oyster and other fisheries of Chesapeake Bay.

Metropolitan Districts of the Eastern Seaboard. Four great cities, Boston, New York, Philadelphia, and Baltimore, dominate the industry and commerce of the Eastern Seaboard. These cities, with their suburbs, have come to be metropolitan districts of the first order of size and importance (Figs. 195 and 202). In each metropolitan district the central city is connected with its suburbs by systems of rapid transportation. In many cases the built-up area of the central city merges without interruption into the built-up area of a suburb. Each district is a great port, each is an important trading center, each ranks high in manufacturing, and each is a great financial center.

QUESTIONS

A. *General questions*

1. In what occupational groups are the majority of the people of the Eastern Seaboard employed?

2. What are the major groups of manufactured goods produced in the Eastern Seaboard?

3. Is the summer route of ships plying between New York and Liverpool longer than their winter routes, shorter, or about the same length? Explain.

4. During which season is it more convenient for vessels from New York to call at Halifax en route to Liverpool?

B. *Major cities of the Eastern Seaboard*

1. Many cities of the Eastern Seaboard are located on the seacoast. What advantages does a coastal location afford for transport, trade, and manufacturing?

2. In the Eastern Seaboard are there more cities near the heads of the bays, or near the seaward ends of the peninsulas? Explain.

3. Why did a line of cities develop in the Blackstone Valley (Fig. 165 and p. 282)?

4. Why is there a line of cities extending in a northeasterly direction from New York City (Figs. 195, 204, 207, and Plates II and III)?

5. Why is there a line of cities extending westward from Albany? Name four cities in this line.

6. Why have cities developed in Eastern Pennsylvania (Chaps. XX, XXI, and Figs. 77, 78, 82, 175, 180, and 204)?

EXERCISE

Many cities of the Eastern Seaboard are famous for the manufacture of some particular product. Check the items listed in the second (right hand) column of Figure 201 to see if you know one or more cities of the Eastern Seaboard in which each product is manufactured. Reference to Figures 195 and 202 will help you to remember the major cities. Arrange in the following tabular form ten of the cases where you know the product and the city or cities in which it is manufactured.

Manufactured Products	City of Manufacture
Men's and women's clothing	*New York City (also Rochester, Baltimore, and Philadelphia)*

CHAPTER XXVI

METROPOLITAN NEW YORK IN TRADE AND TRANSPORTATION

1. *New York as a Center of Trade*

New York Buys; New York Sells. New York, first and foremost, is a trading center—a place where goods are bought and sold. It is scarcely an exaggeration to state that at the end of a business day in New York nearly every commodity known to the Commercial World has exchanged ownership. In many cases the goods bought and sold are at hand in the stores, warehouses, wholesale establishments, or factories. Not infrequently, however, a sale takes place before the goods are produced or while they are still in a distant country. In such cases the selling agent or broker simply agrees to deliver the goods to the buyer at some future time.

Business and Trade Focus on Manhattan Island. Manhattan Island is pre-eminent in the business and trade of Metropolitan New York. On the island there are two main business centers. The first is known as the financial district and lies at the southern end of the island (Fig. 203). Here huge skyscrapers house the great banks, the organized exchanges, and the other commercial enterprises of this great area (Fig. 198). Here also are the head offices of many railroads and of many manufacturing companies. From the roof of a skyscraper in this district one can look down upon docks and piers of Manhattan, Brooklyn, and Jersey City, where ocean liners load and discharge their cargoes and passengers.

The second center is called the central retail district and lies farther north, nearer the center of the island. In this area another group of skyscrapers marks the stores and shops, the hotels, and the theaters for which New York is famous. Here also are the great passenger stations of the New York Central and Pennsylvania railroads. Between the two business districts is an area largely given over to the fruit and produce, grocery, leather, shoe, textile, and other wholesale markets. Land in the two skyscraper districts commands a higher value than in any other part of the metropolitan area, if not of the country. This high value reflects the fact that Manhattan is the center of Metropolitan New York and that Metropolitan New York is in turn the center of a huge trading area.

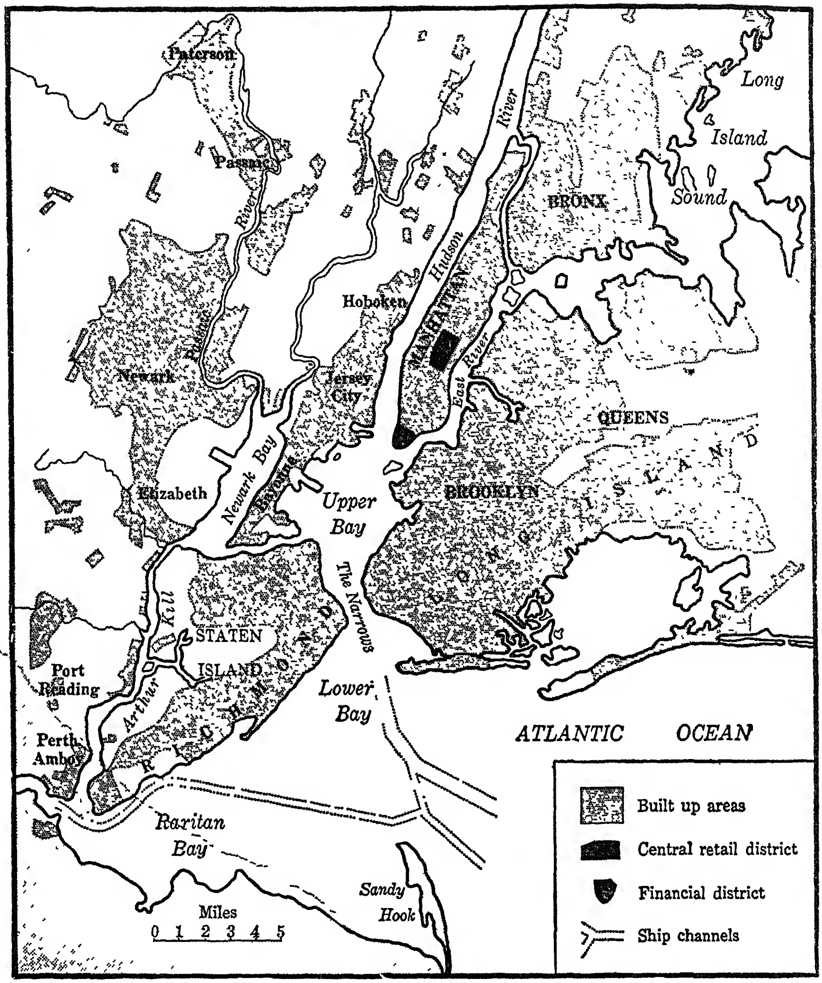


Fig. 203. New York City and its suburbs

2. *New York as a Railway Center*

Why Railroads Focus on New York. The importance of New York as a railway center is emphasized when a comparison is made with the other metropolitan areas of the Eastern Seaboard. As against New York's 12 lines, Boston has 3, Philadelphia has 3, and Baltimore has 4. The greater number entering New York reflects the natural advantages possessed by this metropolitan area.

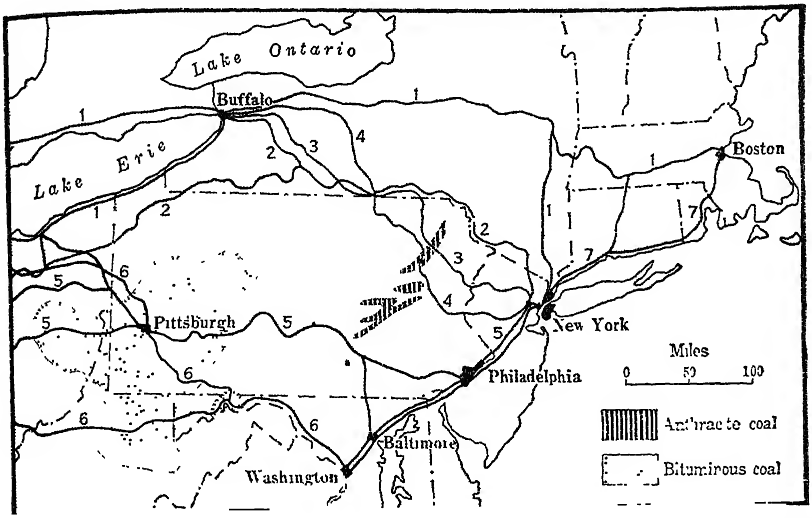


Fig. 204. Routes of main railway lines connecting the Eastern Seaboard with Lake Erie and the Middle West. 1, New York Central; 2, Erie; 3, Delaware, Lackawanna and Western; 4, Lehigh Valley; 5, Pennsylvania; 6, Baltimore and Ohio; 7, New York, New Haven and Hartford

Central location of New York in the Eastern Seaboard. A location near the center of the Eastern Seaboard has led to the convergence of railroads on New York (Fig. 204). Other things being equal, the center is more readily accessible from all parts of a region than is any other point. Thus more railroads from Lake Erie and the Middle West focus on New York near the center of the Eastern Seaboard than on Boston at one extremity or on Baltimore at the other.

The central position of New York City in the Eastern Seaboard is emphasized by the Hudson River and by the highlands which border the river in its lower course (Fig. 205). The Hudson, a broad and deep stream, is in reality an arm of the sea, for tides affect it as far upstream as Albany. In so far as railways are concerned, the lower Hudson cuts the Eastern Seaboard into two divisions. The terminals of all the lines cluster near the mouth of the Hudson instead of spreading farther upstream, because the steep bluffs which flank the river in its lower course prevent the railroads from reaching it conveniently except at its mouth. On the west side, especially, the precipitous Palisades bar approach to the river (Fig. 206). As a result, the several lines from points east of the river and the still

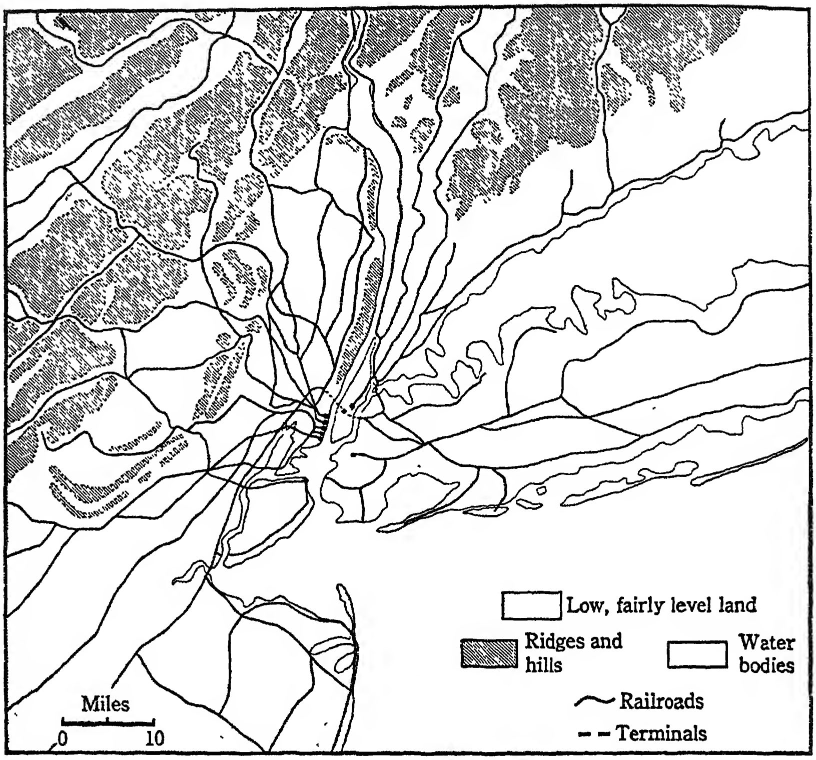
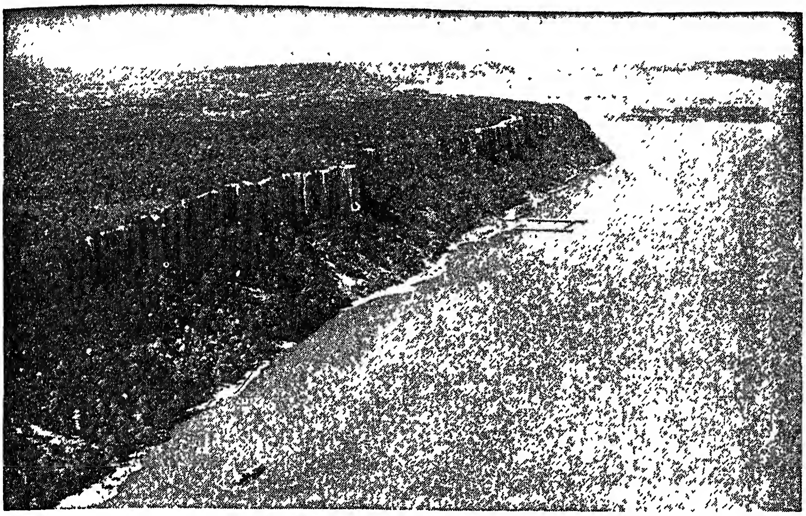


Fig. 205. Railways and land forms in Metropolitan New York. The railways approach the city along valleys or through low passes in the ridges

greater number from the west are gathered into a compact bundle at the mouth of the Hudson. Astride this bundle, like a spider in the center of its web, sits Metropolitan New York.

New York commands routes across the Appalachian Highland. A second and highly important reason for the convergence of railroads at New York is its location in relation to routes across the Appalachian Highland. This highland lies between the Atlantic Coast and the Middle West, and all railroads leading from the seaboard to the interior of the country must cross it (Fig. 207). In building these railroads the engineers took advantage of the valleys of the Hudson, Delaware, Susquehanna, Potomac, and other rivers which drain the area. The New York Central, for example, follows the valleys of the Hudson and Mohawk rivers; the Pennsylvania, for a distance west of Harrisburg, follows a tributary of the Susquehanna; and the



[American Airlines, Inc.

FIG. 206. The Lower Hudson and the Palisades on its western bank

Baltimore and Ohio follows the valley of the Potomac for many miles (Figs. 204 and 207 and Plate III). Both the Lehigh Valley and the Lackawanna railroad take their names from valleys followed for a distance by their main lines.

Of the seaboard metropolitan areas, New York alone commands all the railroad routes to the west. This fact is illustrated by its relation to the New York Central and Pennsylvania systems (Fig. 204). The New York Central, approaching the seaboard from Buffalo, on Lake Erie, reaches Boston and New York, but not Philadelphia and Baltimore. The Pennsylvania, placed farther south and approaching the seaboard via Pittsburgh, reaches Baltimore, Philadelphia, and New York, but not Boston. New York, in the center, is the only ocean port served by both these great systems and is the only one of the four metropolitan areas reached by the rails of the Erie, Lackawanna, and Lehigh Valley systems.

Terminals in Metropolitan New York. In the development of terminals and in carrying on its vast trade, Metropolitan New York is both favored and hindered by the character of its site. On the one hand, the Hudson and other water bodies which break the area into several islands and peninsulas provide a water frontage of 771 miles (Fig. 203). Such a long water front has favored the construction of seaboard terminals by the railroads and of piers and docks for the

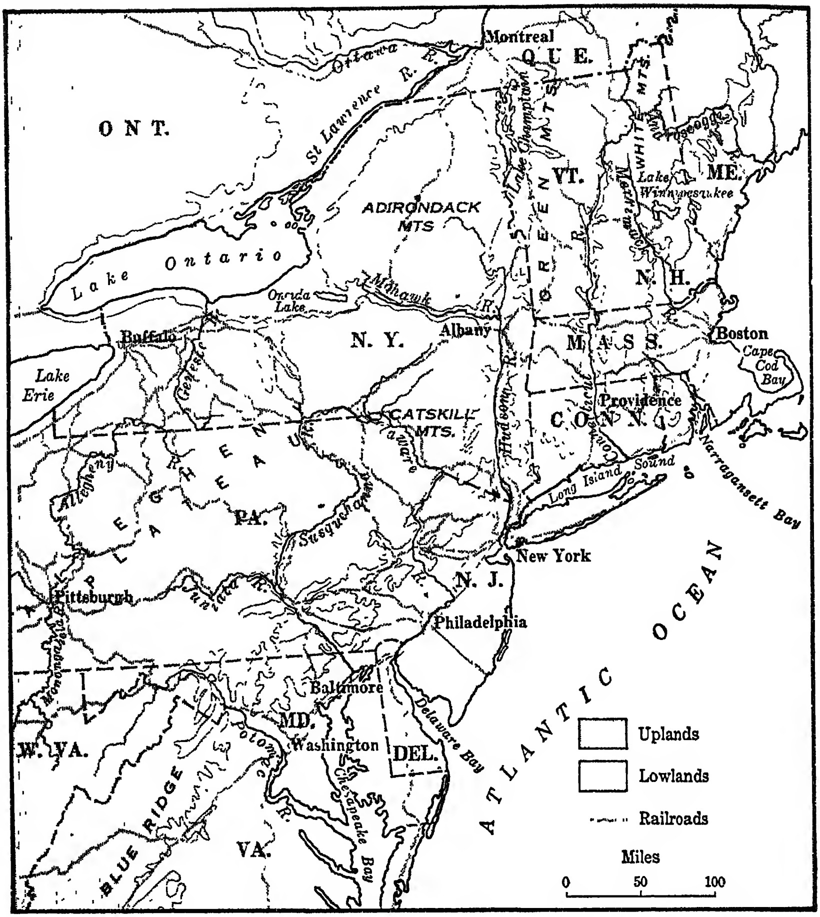


Fig. 207. Railroads and surface features in the northeastern part of the United States. Note how the railroads follow the river valleys in crossing the uplands

steamship companies. On the other hand, the water bodies make it difficult to maintain adequate passenger and freight services from one section of the metropolitan area to another.

Passenger terminals. Railway passenger traffic into New York focuses on Manhattan Island, the center of the metropolitan area. The railroads, however, have found it no easy task to develop satisfactory passenger service to Manhattan; in fact, only two systems—the New York Central and the Pennsylvania—operate trains over their own tracks into passenger terminals on the island (Fig. 205). The former

reaches the island at its northeastern extremity, where the narrow Harlem River is crossed by a short bridge, and the latter has a tunnel under the Hudson River. Three other lines lease the right to operate certain of their trains into these terminals. The remaining lines transfer passengers by ferry across the Hudson from their New Jersey terminals.

Commercial terminals. The commercial terminals in Metropolitan New York include the water-front freight terminals of the railroads and the docks and piers of the steamship companies. Except for the terminals of the three railway companies operating east of the Hudson, all the water-front freight terminals of the railroads lie on the west side of the Hudson and Upper Bay. Several of the railways owning terminals on the New Jersey side also control piers on Manhattan in order to facilitate the movement of goods between their New Jersey piers and Manhattan. The steamship terminals are mainly in four groups: one in Jersey City and Hoboken, another on the lower west side of Manhattan, a third on the lower east side of Manhattan, and a fourth along the Brooklyn water front (Figs. 198, 203, and 208).

The transfer of goods from one terminal to another is accomplished by means of lighters and car floats (Fig. 209). Lighters are flat-bottomed barges, some of which are covered to protect goods from the weather. Freight is unloaded into the lighters from a car or vessel, and the lighters are then towed across to another terminal or alongside a ship, as the case may be. In most instances, if the goods have been consigned in carload lots, the loaded cars are switched to car floats which ferry them to some other part of the water front. The transfer of goods by lighters and car floats requires time and expense, and in bad weather the transfer may be unduly delayed. The system concretely expresses the fact that Metropolitan New York is divided into a number of islands and peninsulas by a complex system of watercourses.

Industrial terminals. In addition to their passenger and commercial terminals, a number of railways have developed industrial terminals on the water front. Prominent examples of this type of terminal are at Perth Amboy, Port Reading, and Elizabethport on Arthur Kill, and at Bayonne on the west side of Upper Bay (Fig. 203). These terminals serve those manufacturing industries interested in both a railway and a water-front location. Such a location gives a

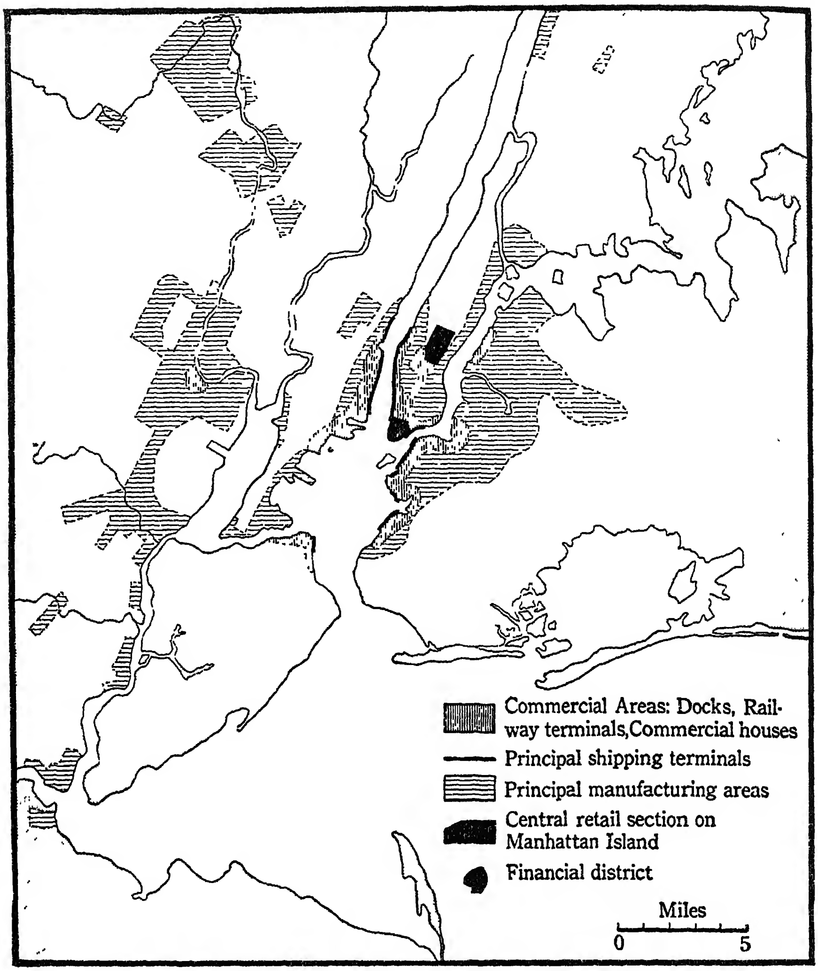


Fig. 208. Principal commercial and manufacturing divisions of Metropolitan New York

plant the choice of receiving its raw materials and shipping its product either by rail or by water. At Perth Amboy, for example, there are large copper and lead smelting and refining works and also chemical and fertilizer plants. Bayonne has large petroleum refineries. To these refineries crude petroleum can be brought by land and sea, and from them the refined products are distributed by rail, truck, and water to points on the Eastern Seaboard and to inland and oversea markets.

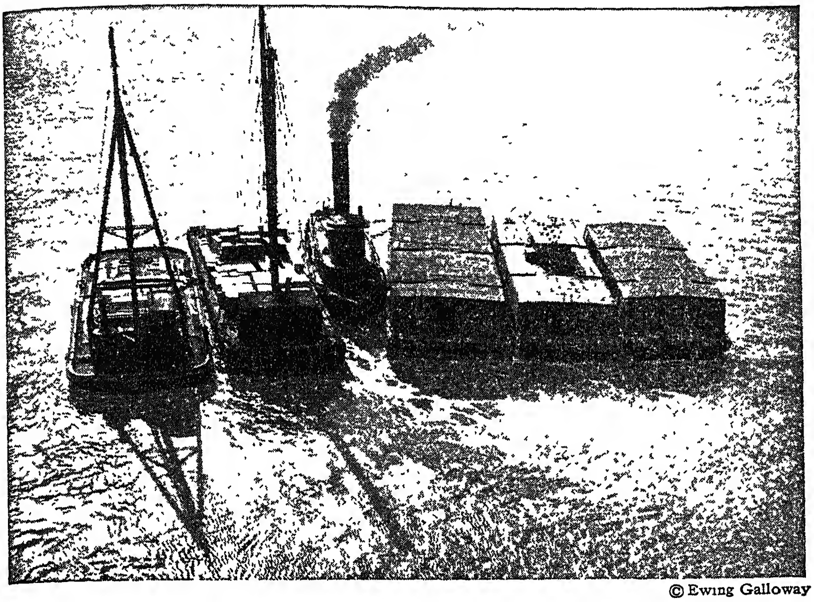


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Fig. 209. Covered and uncovered lighters being towed from Jersey City to Manhattan

3. *The Port of New York*

Facilities and Services Favor Growth of Port. If you suddenly were called upon to go to Europe, you probably would sail from New York. This statement holds true, no matter in what part of the country you may live. If, for example, an official of a furniture factory in Grand Rapids, or a tobacco exporter in Durham, or an executive from any American city has business abroad, he finds his quickest and most satisfactory service via New York. The explanation lies in two facts. First, there are more frequent sailings and faster ships from New York to Europe than from any other American port; second, a large number of cities in this country have more satisfactory train services to New York than to any other point on our Atlantic Coast.

The advantages of frequent railway and shipping services are as important for freight and express traffic as for passenger traffic. Suppose, by way of illustration, that a manufacturer in Akron, Ohio, is to export small quantities of rubber goods to England, Egypt, South Africa, and Argentina. From Akron, as well as from most other

interior points, the number of through freight services to New York equals or exceeds the number to any other port. This is one reason why the manufacturer ships his goods through New York. Moreover, if he routes his shipments via New York, he can be more certain of booking ship space to all these foreign countries at a relatively early date than if he ships through any other port. Consequently he can combine the several small lots into carload lots for shipment to the point of export. This procedure will lessen his shipping costs; for railways quote a lower rate on carloads than on less-than-carload lots. Frequent sailings to many points, therefore, constitute a marked advantage for the port of New York, and this advantage draws much freight to it. In reverse order, much the same conditions apply to imports into this country.

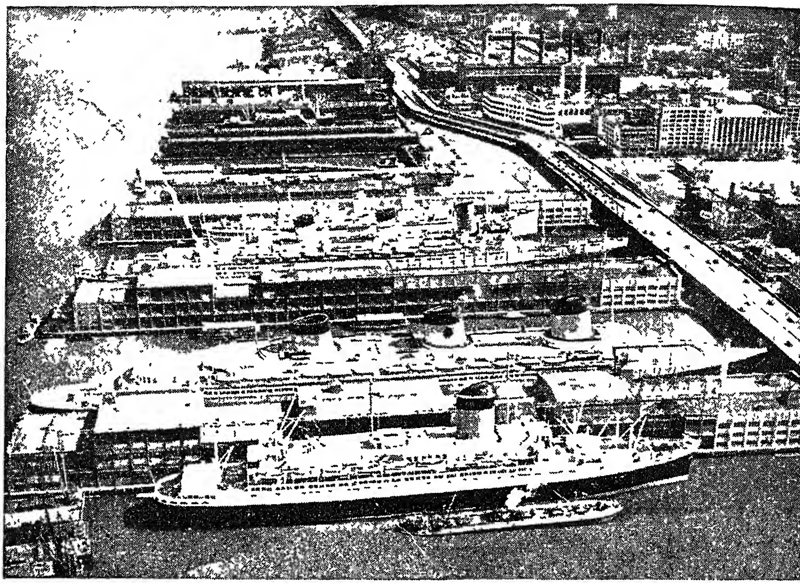
Trading Organizations to Handle Foreign Business. On account of the fact that both land and sea routes focus on the port of New York, many firms in other parts of the country have located their export or import offices in New York City. These offices book ship space, see that goods are transferred from rail to ship, make out the necessary documents, and, in fact, look after the foreign business of their firms. Since many companies do not have sufficient foreign business to warrant a special office, they employ agents or firms who specialize in handling foreign trade. In New York there are such a large number and variety of these firms that goods can be handled expertly for any line of business and for any part of the Commercial World. Similar agencies are maintained at our other ports, but New York leads in number and variety.

The Port of New York Favored by Natural Conditions. In its port activities Metropolitan New York is highly favored by natural conditions. As we have seen, the long water front gives abundant room for the construction of docks and terminals. The natural depth of water leading to many of the docks is sufficient for an average ship, and it has not been an overly expensive task to deepen these channels to admit the largest ships afloat (Fig. 203). Upper Bay and the Hudson furnish broad and safe roadsteads in which to anchor ships. In contrast to many European ports, where big ships cannot enter except at high tide and where the rise and fall of the tide inconveniences loading and unloading, the tidal range at New York is so slight that ships can come and go and load and unload at any time. Unlike the port of Montreal, which is closed by ice during the winter, New York

is open throughout the year. Moreover, it is relatively free from fogs. Furthermore, the channel from the principal docks to the open sea is only about 20 miles long. This means that less time is required in getting ships to or from the docks than in the longer channels at many other ports.

Shipping and Shipping Services. The diversified shipping services at the port of New York are illustrated by four steamships which were sighted off Sandy Hook on one summer morning (Fig. 203). The first to appear was a tanker loaded with crude oil from Venezuela; the second was a slow British tramp coming from Chile via Panama with a cargo of nitrate and copper. Next came a trim cargo-passenger liner, much larger than the first two. It flew the flag of a famous American line and had sailed from Buenos Aires with a part cargo of wool, quebracho extract, and hides and skins. Calling at Santos, it had taken on 1500 tons of coffee, and later at Trinidad it had completed its cargo with cacao. In addition to its cargo, upward of a hundred passengers were aboard. Finally there appeared, majestically but swiftly, a transatlantic liner—one of the largest ships afloat. This great ship had sailed from Southampton five days before, carrying 3000 passengers, vast quantities of mail and express, and a small amount of cargo.

As the ships approached the opening into Lower Bay, each of them headed for one of the channels which lead across the broad bar between Lower Bay and the open sea (Fig. 203). Near the entrance to the channel a tug came alongside and a pilot climbed nimbly up a rope ladder to the deck; for no ship is permitted to navigate these channels without a pilot. The tramp, with its load of nitrate and copper, turned westward into a 20-foot channel leading up Raritan Bay. Proceeding to Perth Amboy, it delivered its cargo to the refining and chemical plants in that industrial terminal. The other ships entered the channel leading to Upper Bay. This channel is the main entrance to the port of New York and is maintained by the United States government at a width of 2000 feet and a depth of 40 feet. After passing The Narrows, the tanker turned into a channel leading to the big oil refineries at Bayonne. The other two ships continued to the commercial section of the port (Fig. 208). The cargo-passenger ship from South America docked, as do many ships in the Latin American trade, at a pier in Brooklyn. The transatlantic liner, however, kept on until it reached the lower Hudson. There powerful tugs



Fairchild Aerial Surveys, Inc.

FIG. 210. Huge passenger liners at their New York piers

came alongside and, with much puffing, warped this giant among ships into a slip on the Manhattan side of the river (Fig. 210).

In addition to the four ships of our illustration, New York is connected with many other regions by cargo liners; that is, ships which run on schedule but do not carry passengers. These five types of shipping are so well developed that from New York, as from London and Hamburg, a sailing may be had and goods may be shipped to practically all parts of the Commercial World. Every flag of any importance in oversea trade is represented in the ships which ply to these ports; and the crews, taken together, make up a pageant of the maritime peoples.

Oversea Trade. Nearly half the total imports and more than a third of the total exports of the United States move through the port of New York (Fig. 211). This fact reflects the position of New York between highly productive sections of our country, on the one hand, and the regions with which we trade, on the other. Metropolitan New York is in itself a great market, importing large quantities of raw materials for its factories, and foods and beverages for its population. Its factories also contribute many things to the export trade. It is the principal port for the Manufacturing Belt, the Corn Belt, and the

Year	Percentage of United States Foreign Trade Handled by the Port of New York	
	Imports	*Exports*
	Per Cent	*Per Cent*
1870	64	50
1880	69	47
1890	65	41
1900	63	37
1910	60	37
1920	55	40
1930	48	36
1935	41	35

FIG. 211. Relation of the port of New York to the foreign trade of the United States

interior wheat-growing areas, and thus handles more than half such typical American products as automobiles, agricultural machinery, leather, boots and shoes, lard, pork and pork products, and a smaller but important part of our wheat, corn, and other cereals. For each of these areas New York is the principal point of import, although by no means the only one. In addition to products from its major tributary area, it handles some goods from the Cotton Belt and the West. It also distributes some imports, especially European manufactures, to all parts of the country.

QUESTIONS

A. *New York and environs* (*Fig.* 203)

1. Describe the location of the following sections of New York City: Manhattan, Bronx, Queens, Brooklyn, and Staten Island.

2. Locate the following suburban cities in New Jersey: Perth Amboy, Elizabeth, Newark, Passaic, Paterson, Jersey City, Hoboken, Bayonne. What facts do you know about any of these cities?

3. Locate the following water bodies: Lower Bay, The Narrows, Raritan Bay, Arthur Kill, Newark Bay, Passaic River, Upper Bay, Hudson River, East River, Long Island Sound. Which of these would you see if you were to sail from Jersey City to Europe?

B. *Transportation in Metropolitan New York* (*Figs.* 203, 205, *and* 208)

1. Why have remarkable engineering and huge sums of money been necessary to provide transportation between Manhattan and other parts of Metropolitan New York?

2. What types of transportation have been provided?

3. How do the railroads deliver passengers to Manhattan Island?

4. If a shipment of agricultural machinery were brought from Chicago by a railroad having a terminal in Jersey City, how would it reach a ship berthed in Brooklyn?

5. All railroads entering Chicago are connected by belt-line railroads (Fig. 94). Why have not similar facilities been provided in Metropolitan New York?

6. Of the main railway lines of the Eastern Seaboard, which serve coal-mining areas and which do not (Fig. 204)?

7. What is the significance of the Palisades in the transportation pattern of Metropolitan New York?

8. Of what importance to New York City is its central position in the Eastern Seaboard?

9. What is the purpose of each of the three types of railway terminals in Metropolitan New York?

C. *Export routing*

1. Why would an automobile manufacturer in Detroit be more likely to route his exports via New York than any other port?

2. Why is some raw cotton shipped from the port of New York?

3. Why might wheat from Canada be exported through the port of New York?

4. Why might motion-picture films made in Los Angeles be exported from New York?

5. Why have more immigrants into the United States landed at New York than at all other North American ports combined?

EXERCISES

Relation of New York to selected items in our foreign trade

1. New York commonly imports about 40 per cent of the sugar, 88 per cent of the cacao, 90 per cent of the rubber, and 60 per cent of the wool for clothing imported into this country. Explain in writing.

2. New York commonly exports about 70 per cent of the lard, 70 per cent of the automobiles, 60 per cent of the agricultural machinery, but less than 1 per cent of the raw cotton, lumber, and citrus fruits exported from this country. Explain in writing.

MANUFACTURING IN METROPOLITAN NEW YORK

Diversity of Manufacturing. Suppose you were hired to make a careful study of manufacturing in Metropolitan New York. You shortly would find that you had undertaken a huge task. In the progress of your study you might find it necessary to visit a representative plant in each line of industry. Thus, you might spend a day in one of the thousands of clothing factories; another day in a printing and publishing house; and a day each in a shoe factory, a silk mill, a machine shop, a refinery, a chemical plant, and so on through the list of industries in the area. When you had completed this part of your study, you would have consumed the better part of a year, for the Federal census lists more than 300 industries in New York City alone.

Major Types of Manufacturing. Long before you had completed your field survey you would probably have noted that four classes, or types, of industry are especially prominent. As might be expected in an area of upward of 9,000,000 people, three of these classes are concerned with such essentials as food, wearing apparel, and shelter. The fourth includes printing and publishing, tobacco, and specialty lines which flourish in a prosperous and densely peopled area. In addition to the four classes, there are a large number of smelters, refineries, and mills turning out metals, chemicals, and other crude or partly finished products. These products become the raw materials for other types of manufacturing.

Food-manufacturing Industries. The fresh fruits, vegetables, milk, and eggs destined for the New York market come in a form ready for consumption. Wheat, raw sugar, and many other commodities, however, must be processed to prepare them for use. Upward of 80,000 people in Metropolitan New York are employed in the food-manufacturing industries. Of these industries, bread and bakery products, slaughtering and meat-packing, and the roasting and packing of coffee, spices, and cacao are important examples. In addition to their local business, most of the industries ship to more distant points.

Materials for Housing and Construction. The growth of Metropolitan New York creates an enormous demand for housing and construction materials. The metropolitan area is expanding vertically

with its skyscrapers and horizontally with the growth of its suburbs. The ever-increasing traffic, moreover, calls for the construction and improvement of streets, railways, subways, and the like. In order to supply the building and construction trades with the materials they require, a large number of woodworking industries, foundry and machine shops, electroplating and welding plants, and other plants of similar nature have developed within the metropolitan area.

The raw materials used in the manufacture of supplies for the building trades come largely from outside Metropolitan New York. Steel rods and other structural iron and steel, for example, come largely from steel centers in Eastern Pennsylvania or from Pittsburgh and Buffalo. Lumber is brought from many regions and is used for a great variety of purposes, including interior finishing, furniture-making, and sash and door manufacturing. Brick and cement are produced principally at other points in the Eastern Seaboard, but some are made in the metropolitan area. Copper, zinc, lead, and tin either come from the refineries in the industrial sections of the port or are brought from other regions.

Printing and Publishing. The printing and publishing industries are a feature of all American cities. In the metropolitan districts especially the demands for printing are both large in amount and varied in character. New York, Chicago, Philadelphia, Boston, and St. Louis, in the order named, are our principal printing and publishing centers. New York's leadership in printing and publishing is indicated by the fact that it employs approximately a fifth of the total number of persons engaged in these industries.

The Clothing Industry. The market for clothing is country-wide. Everyone needs clothing, and everyone buys it. The manufacture of clothing, however, is localized in a few cities. Five of these cities—New York, Philadelphia, Boston, Baltimore, and Rochester—are in the Eastern Seaboard; four—Chicago, St. Louis, Cincinnati, and Cleveland—are in the Middle West. New York, Chicago, Rochester, Baltimore, and Philadelphia, in that order, lead in the production of men's clothing, and New York dominates the manufacture of women's clothing. All these cities are railroad and trading centers for large and important sections of the country. All of them are therefore in a position to distribute goods quickly to many cities and villages. Being cities of major rank, they also have an abundant supply of labor—a prime requisite in the clothing industry.

Importance of Metropolitan New York in the Clothing Industry. New York designs clothing, makes clothing, and sells clothing. Clothing manufacture is, in fact, the leading industry of New York, and New York is the leading clothing-manufacturing center of the country. The market for New York's clothing is country-wide; for more than 70 per cent of the women's clothing and about 40 per cent of the men's clothing manufactured in the United States are made in this metropolitan area. In addition, New York produces considerably more than half the fur goods and millinery made in this country and almost half the men's caps, shirts, and other furnishings.

Why the Clothing Industry Is Localized on Manhattan Island. Within Metropolitan New York the clothing industry is restricted in large measure to the Manhattan section of New York City. Most of the jobbing houses are located in or near the central retail district, while many of the shops and factories lie between the central retail and financial districts (Fig. 208). This surprising concentration of a great industry in a small area is explained by advantages for manufacturing, selling, and distributing clothing.

The central retail district the style center of the country. Style plays a highly important role in the clothing industry. New York City is the style center of the country, and the central retail section on Manhattan Island is the style center of New York. Therefore the clothing industry is located in or near this central district.

Location on Manhattan facilitates deliveries to retailers. Since fashions may change almost overnight, the clothing industry is a highly speculative business. Stores and shops in the central retail district of New York display the latest fashions in gowns, furs, men's wear, and other types of clothing. As their rentals are high and styles change rapidly, the retail establishments commonly carry only small stocks of any one line. They depend upon jobbers for additional supplies and receive such supplies as often as their sales warrant. Because the jobbers must carry big stocks of goods and thereby assume the risk of loss through a change of fashion, they have become the directors, the creators, and in some instances the dictators of the clothing industry. They design or adapt the styles, manufacture (or contract for the manufacture of) goods, and carry huge stocks with which to supply the retail trade.

Jobbers find a location in or near the central retail district desirable, because they are within a few blocks of their customers and can

make frequent deliveries of small quantities of goods. This location, moreover, is convenient for dispatching goods to retailers in Brooklyn, Newark, and other parts of the metropolitan area, because the bridges, the subways, and the principal elevated and surface lines focus on central and southern Manhattan. This focus of transportation, in fact, explains why the central part of Manhattan has become the central retail district.

Location facilitates trade with other cities. Jobbers also find a location in or near the central retail district convenient for serving buyers from other cities. Here, again, we find evidence of New York's importance as a railway center. Because most American cities have fast passenger services to New York City, buyers for department stores and exclusive shops in those cities can come conveniently to New York to purchase stocks. All out-of-town passenger traffic is focused on the central retail district, and the huge hotels patronized by the out-of-town trade are in this same district. As a result, jobbers find that a location near the railway terminals and hotels puts them in a position to attract trade and to ship goods on short notice to out-of-town customers.

Factories need to be near jobbers. Many of the shops or factories which manufacture clothing are near the jobbing houses. In some instances both the factory and the display rooms of the jobber are in a building only a short walking distance from the retail establishments. In this way the whims of fashion can be followed, and a garment completed in the morning may be worn in the afternoon. A good deal of the clothing is turned out by small factories; but large quantities are made on contract in small shops or in the homes of workmen. These shops and factories cluster about the southern margin of the retail district, where they are readily accessible to the jobbing houses. In the more stable lines, such as men's shirts, trousers, and underwear, some of the factories are in outlying sections of the metropolitan area.

Labor readily available on Manhattan. The clothing industry, almost more than any other line of manufacturing, requires a large amount of labor. Commonly the industry employs over a fourth of all factory wage-earners in New York City. The demand for labor varies from season to season and also with changes in style. Between seasons manufacturers reduce their forces greatly, but during rush periods they need hundreds of extra hands. Probably no other point

in this country is as well equipped to meet such a labor problem as is Lower Manhattan. This section of the city, particularly on the east side, is extremely crowded; and Brooklyn, another crowded section of the metropolitan area, is only a few minutes' ride away. Laborers from other sections of the United States and immigrants from Europe commonly are landed on Manhattan. For these reasons a factory on Manhattan can recruit a labor force on short notice.

Importance of New York in the Textile Industries. Manhattan and the other sections of Metropolitan New York are of great importance to the textile as well as the clothing industries. In the first place, New York leads in the manufacture of clothing and naturally is an important market for wool, silk, cotton, and other fabrics. In the second place, New York is the textile-distributing center of the country, both for goods of domestic manufacture and for fabrics imported into the United States from the United Kingdom and other oversea countries. In the third place, Metropolitan New York is one of the major textile-manufacturing districts in this country, being of especial importance in the production of silk and woolen goods. Finally, a large proportion of all the textiles produced in this country are dyed and finished in the New Jersey section of the metropolitan area.

Woolen-Manufacturing. Metropolitan New York plays a double role in woolen-manufacturing. Role one is the manufacture of knit jerseys, fancy hosiery, and other novelty goods on Manhattan Island and in Brooklyn. These goods are subject to the whim of fashion and, like gowns, jewelry, and haberdashery, may be made with profit near the central retail district. Role two is the manufacture of woolen and worsted cloth and other staple woolen goods in the New Jersey section of the metropolitan area. In this respect Metropolitan New York is part of the belt of woolen-manufacturing which extends from Metropolitan Philadelphia, at the south, to the Mohawk Valley and Southern New England, at the north and east. This belt constitutes the major woolen-manufacturing area in the country; but woolens also are manufactured in the Middle West and to some extent in the South and in the Pacific Northwest.

Silk-Manufacturing Localized in and near Metropolitan New York. Silk-manufacturing in the United States is distinctly an industry of the Eastern Seaboard, and in that region it is localized in the middle section. If an arc with a radius of 150 miles be drawn, with

Manhattan Island as the center, it will include most of the silk mills in this country. More than half the mills are located in New York and its environs. Paterson, in fact, is the leading silk-manufacturing center in the country. Beyond the margins of Metropolitan New York silk-manufacturing spreads eastward into Connecticut and Massachusetts and westward into the manufacturing and coal-mining cities of Eastern Pennsylvania.

Why is silk-manufacturing localized in or near Metropolitan New York? First, because the mills profit by having ready access to the clothing industries and the silk jobbers in New York City. Second, because labor is available in this densely peopled area. Third, because the principal silk-importing companies are in New York, and raw silk is distributed from warehouses near the Hudson. Finally, the principal dyeing and finishing plants are in Passaic and near-by points in the New Jersey section of the metropolitan area.

Manufacturing Advantages: A Summary. The clothing and textile industries in Metropolitan New York well illustrate the advantages for manufacturing possessed by our major metropolitan areas in the Eastern Seaboard. Fundamentally, success in manufacturing becomes a question of profits. To gain a profit, the manufacturer must be able to sell the goods he makes for more than it costs to make them. Here lies New York's advantage as a manufacturing center. For certain lines of manufacturing there are few if any places in the world where profits can be made as satisfactorily as in Metropolitan New York. With its transportation facilities and trading agencies, it has advantages both for assembling raw materials and for selling and distributing the finished goods. In addition, its nearness to Pennsylvania coal, its large population, its financial leadership, and the skill gained through long experience are other important advantages. With the exception of central position, these advantages are shared by the other metropolitan districts of the Eastern Seaboard.

QUESTIONS

A. *Industries*

1. Why are the food, clothing, and building industries prominent in Metropolitan New York?

2. What is the relation of New York to the coffee industry of the United States?

3. Why is it logical for sugar refining to be carried on in Metropolitan New York?

4. Why are there many small wood-working establishments in Metropolitan New York, rather than a few large ones?

5. In view of the fact that copper is not mined in Metropolitan New York, why are there large copper refineries in the area?

6. Many book-publishing firms have headquarters in New York City. Why?

B. *Distribution of manufacturing within the metropolitan area (Figs. 203 and 208)*

1. What types of manufacturing establishments are located on Manhattan Island? Why there?

2. What type of manufacturing is carried on in Passaic? in Paterson? in Bayonne? in Perth Amboy? Explain in each case.

3. Jersey City and Hoboken are primarily commercial cities. Why?

4. Newark and Elizabeth have a great diversity of manufacturing. What advantages do these cities possess for manufacturing?

EXERCISES

1. *Landscape in metropolitan New York*

After reviewing Chapters XXV, XXVI, and XXVII, especially the maps and pictures, write a 300-word description of the "Landscape of Metropolitan New York." Bring out the several sections of the city, the street pattern on Manhattan, the uses to which the water front is put, the connection between different parts of the area, the railway pattern, and the skyscraper sections. Make a map to illustrate your paper.

2. *A review of conditions favoring manufacturing in Metropolitan New York*

Outline a talk explaining why many manufacturers have chosen Metropolitan New York as a location for their factories. Include (1) the means for assembling raw materials both from foreign countries and from various sections of the United States, (2) advantages for manufacturing the goods, and (3) advantages for selling and distributing the finished products.

3. *Manufacturing in your home city*

Classify the principal lines of manufacturing in your home city into two groups: namely (1) those manufacturing mainly for local consumption, and (2) those manufacturing for both local and more distant consumption.

CHAPTER XXVIII

THE DOMINION OF CANADA

Population and Provinces. Canada ranks as one of the large countries of the world, being slightly larger than the United States. It has only one person, however, for every twelve in the United States; in fact, more people live in the state of New York than in all Canada. Its 11,500,000 people are confined to the southern border of the country, thus being in close contact with the people of the United States (Fig. 67). Such a distribution of population raises two important questions: First, Why should a big country like Canada have so few people? Second, Why is the population of the country confined to the southern border?

Politically, Canada is made up of nine provinces, the Territory of Yukon, and the Northwest Territories (Fig. 212). These provinces compare with our states, each having a government of its own and each being a part of a federal or dominion government. In size they vary from tiny Prince Edward Island to Quebec, more than twice as large as Texas. In fact, three of the provinces and two of the northwest territories are larger than any of our states. As far as size and population are concerned, Ontario and Quebec are the most important provinces. Together they contain more than a fourth of Canada's area and more than 60 per cent of its people.

Language. Unlike the United States, Canada has two official languages, French and English. French Canada, along the St. Lawrence east of Montreal, was settled by French people, and in this area the people still speak French and retain many of their French customs. Large families are the rule, and gradually the French-speaking people have spread into neighboring areas. They till the soil with great care and can make a living where other settlers fail. Today French Canada contains more than a fourth of the population of the country, and it nearly always presents a solid front in Canadian politics. The rest of Canada speaks English, and because the contact between the French and the English sections is in and near Montreal, the largest city, nearly a million and a half Canadians speak both French and English.

Divisions of Canada. In terms of surface features and resources Canada has six major divisions (Fig. 213). The largest is the Laurentian area, extending in an arc from Labrador round Hudson Bay to the

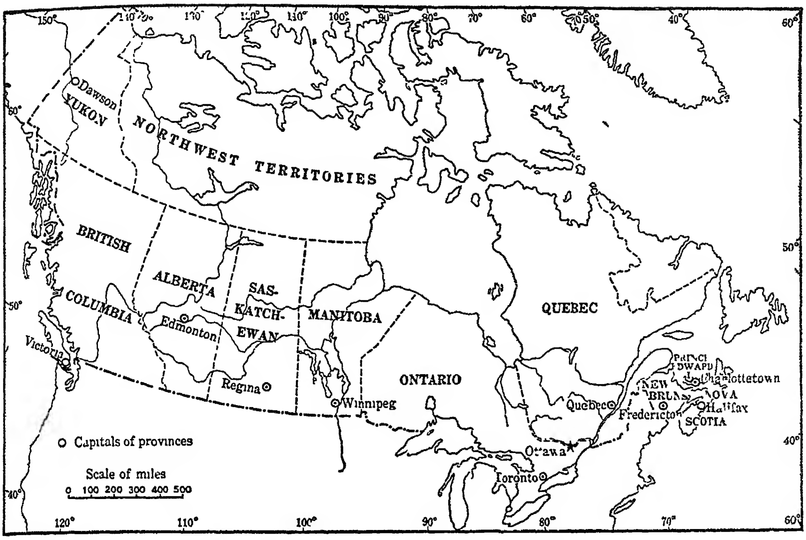


FIG. 212. Provinces of Canada and their capitals

Arctic Coast. It is difficult country, with a rolling, rocky surface, a poor soil cover, many lakes and swamps, and long, severe winters. Except for its minerals and timber it has little to encourage settlement. At the southeast the Laurentian area is bordered by the fertile St. Lawrence Lowland of Ontario and Quebec and at the southwest by the rich prairies and plains of Manitoba, Saskatchewan, and Alberta. These are the major agricultural areas of Canada. The St. Lawrence Lowland also contains most of the manufacturing plants and is by far the most densely peopled section of the country. In the extreme east the three small seaboard provinces—New Brunswick, Nova Scotia, and Prince Edward Island—make up Maritime Canada. In the west the Canadian Cordillera, a vast mountain area mainly in British Columbia, extends from the United States border to Alaska. Lastly, the Mackenzie and Yukon basins make up a sparsely settled northern area, some parts of which are unexplored.

Agriculture and Agricultural Regions. Agriculture, including stock-raising and horticulture, is the chief support of the Canadian people; in fact, agriculture employs 30 per cent of the gainfully employed population. The farms and ranches produce food for Canada, raw materials for Canadian factories, and a big part of Canadian exports. So important are the agricultural exports that Canadian agri-

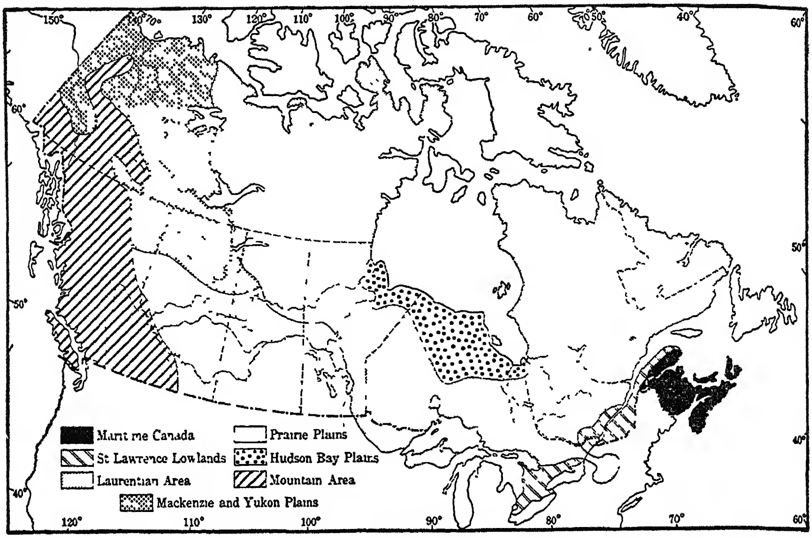


FIG. 213. Major divisions of Canada in terms of surface features and resources

culture is largely on an export basis, with the United States and the United Kingdom as the principal markets. Four sections of the Dominion—the Prairie Provinces, the St. Lawrence Lowlands, Maritime Canada, and southwestern British Columbia—contain most of the agricultural land (Fig. 214).

The three Prairie Provinces—Manitoba, Saskatchewan, and Alberta—together contain more than 60 per cent of the occupied farm acreage of the country. This fact reflects the level well-drained surface and the fertile soil of this huge grassland (Fig. 213 and Plate I). About three fourths of the land in cultivation is devoted to cash crops, particularly wheat, and a fourth to the growing of feed for livestock. The fertile settled section of the Prairie Provinces area extends for nearly 800 miles, from Winnipeg on the east to Edmonton and Calgary on the west, and is one of the great expanses of agricultural land in the world (Fig. 215). It is handicapped by a short frost-free season and by insufficient moisture in some years.

The second area of agricultural importance in Canada lies in the St. Lawrence Lowlands and extends from Lake Huron on the west to the St. Lawrence estuary on the east. This long, narrow area contains about 25 per cent of the occupied farm acreage in Canada—more in Ontario than in Quebec. Three types of agriculture prevail

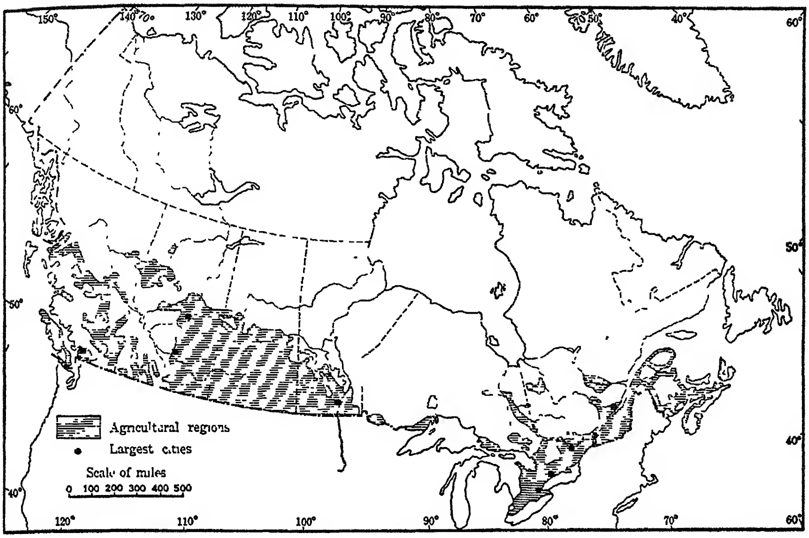
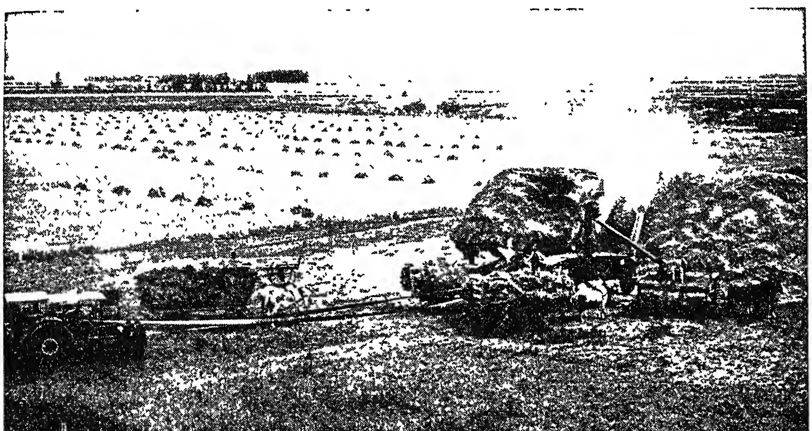


FIG. 214. Agricultural regions of Canada

in the lowlands: mixed farming, dairy farming, and fruit farming (Fig. 216). As in the United States, the more important fruit dis-



Canadian National Railways

FIG. 215. Threshing wheat on the level prairies of western Canada

tricts border the lakes, the section along the southwest shore of Lake Ontario, between the Niagara River and Hamilton, being one of the most productive and beautiful horticultural districts in America.

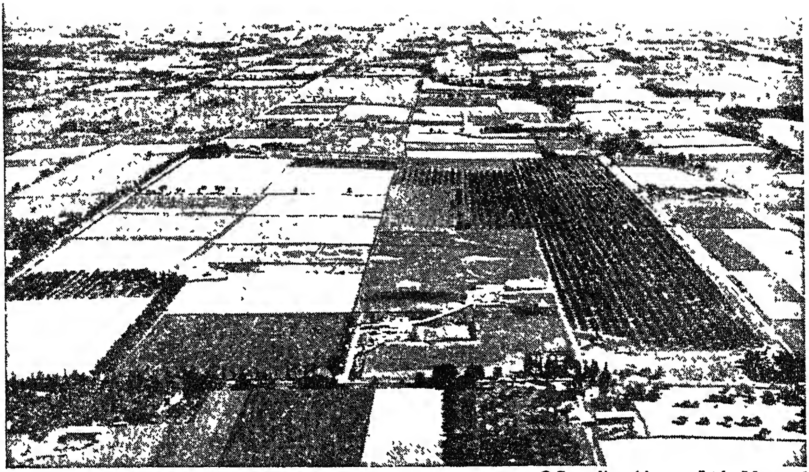


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Fig. 216. Farm lands in the St. Lawrence Lowlands near Toronto, Ontario

In Maritime Canada the tiny province of Prince Edward Island contains good agricultural land from one end to the other; but in Nova Scotia less than 40 per cent and in New Brunswick less than 30 per cent are occupied as farm land. Hay and oats are the principal crops and are grown on most of the farm land. These crops do well in the cool, moist summers characteristic of Maritime Canada. Some hay is exported, but much of the crop is fed to cattle. Nova Scotia exports about 1,500,000 barrels of apples each year (p. 207), and each of the provinces exports potatoes.

In the Far West the principal agricultural areas lie on and near the delta of the Fraser River and in the southeastern part of Vancouver Island. Crops are produced under favorable conditions, but are marketed with difficulty. Except for the demands of Vancouver and other local points, the produce must stand the cost of the long haul to Eastern Canada or to Europe.

Large sections of Canada are unsuited to crops on account of hazardous climate or poor soil or mountain surface. The growing season is short at best, and even in midsummer cool spells of weather retard the growth of crops (Fig. 217). Almost all the Laurentian area is poor in terms of soil, and in British Columbia much of the

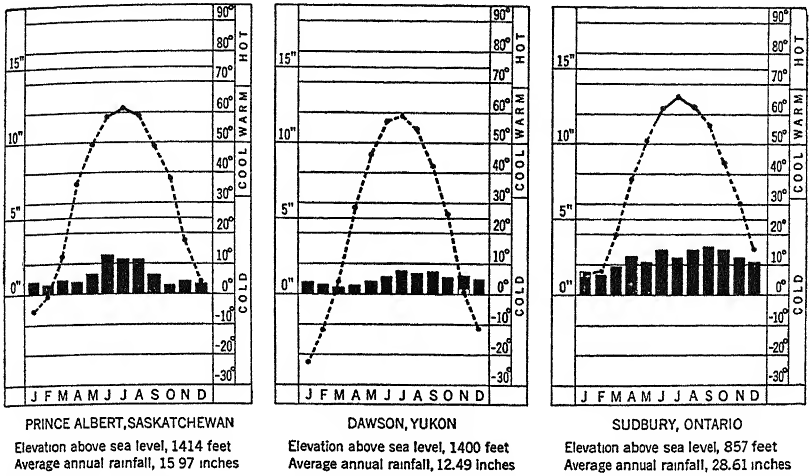

FIG. 217. Temperature and precipitation in Dawson, Yukon; Prince Albert, Saskatchewan; and Sudbury, Ontario

land is too steep for cultivation (Figs. 218 and 219). Under such conditions it is doubtful whether the present farmed area of Canada can be expanded greatly. Large areas of poor land, therefore, help to explain why the total population of this big country is no larger than it is.

Forests. More than a third of the land area of Canada is in forest, and forest products are second in importance to agricultural products (Plate I). Forest industries, however, support only a small number of people as compared with agriculture. Products of the forests form a quarter of the total exports of Canada, and Canada holds the British Empire's principal reserve of softwood lumber. In fact, in the extent of its coniferous forests, Canada is rivaled only by Soviet Asia and the United States.

The forests of Canada occur mainly in three areas. The first is the great coniferous forest of the Pacific slope, a forest which is much like that of our own Pacific Northwest (Chapter XII). This area is estimated to contain about 18 per cent of the accessible timber of the Dominion. The second division is the northern coniferous forest, which extends from the east slopes of the Rocky Mountains to Labrador. In general this forest is made up of spruce, poplar, and birch timber, much of which is too small and poor for lumber. In the eastern half of the country the spruce is cut for pulpwood, from

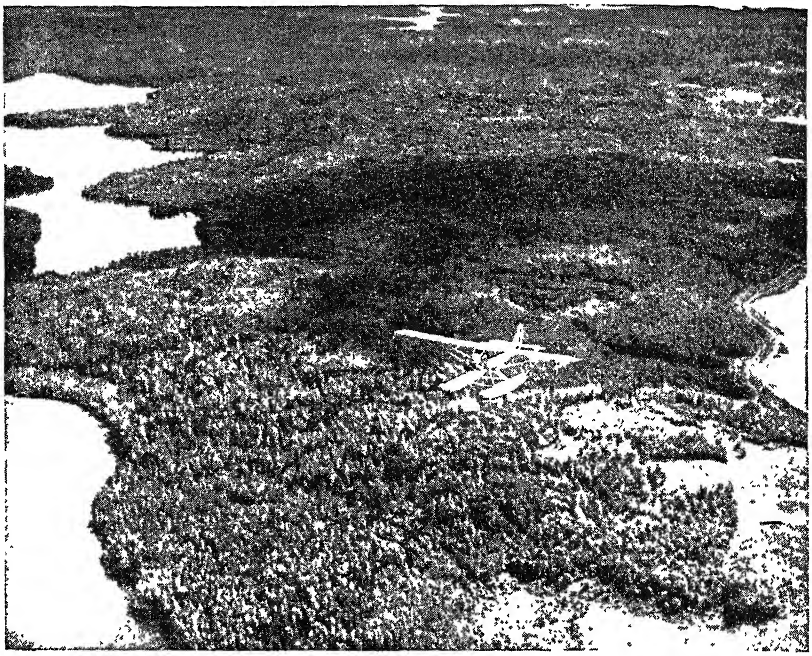

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FIG. 218. View in the Laurentian area

which newsprint paper is made. Canada, in fact, produces more than 35 per cent of the world's production of newsprint; the United States is its great market. The third forest area is in the eastern part of the country and extends from Lake Superior through southern Ontario and Quebec to the Maritime Provinces. The original forest was made up of belts of pine, hemlock, and other softwoods and of belts of maple, oak, hickory, and other hardwoods. Much of the hardwood timber has been cut, and the land cleared for farming. Enough remains to support numerous woodworking industries.

Fisheries. Within two decades after Columbus discovered America, fishermen from Europe had discovered the rich fisheries off the coast of Nova Scotia and Newfoundland. From that time to the present these fishing banks (broad areas of shallow water) have yielded large quantities of cod and other fish. The fisheries extend along a coast line of more than 5000 miles and comprise a fishing area of not less than 200,000 square miles. The fisheries are divided into two types: the offshore fisheries and the inshore fisheries. The offshore fisheries are out on the banks. To these shallow waters cod, hali-

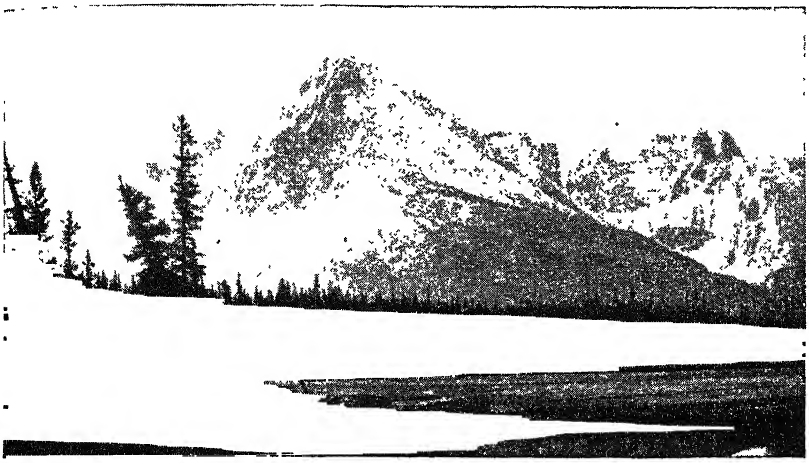


FIG. 219. Mountainous area in British Columbia

but, haddock, herring, mackerel, and other fish come to feed and to spawn. The cod is the most important fish, and in Newfoundland the terms "cod" and "fish" are synonymous. The inshore fisheries are in the shallow waters of the bays and other indentations, and yield lobsters, oysters, and salmon and other fish, which reach the market in fresh or canned form.

The most important fisheries of Canada are on the Pacific Coast. Along the highly irregular coast line the fisheries extend for approximately 7000 miles. Salmon is by far the most important catch, coming from the Fraser, Skeena, and other rivers. Salmon live most of their life in the sea, but come into the fresh water of the rivers to spawn. This practice makes it possible to capture them in such numbers that the salmon catch makes up two fifths of the value of fish production in the Dominion. In addition to the salmon, large quantities of halibut are taken. Carloads of fresh halibut are shipped from Prince Rupert to many markets in the United States and Eastern Canada. In Canada the total domestic consumption of fish is relatively small, and thus the fish trade, like the agriculture and forest trades, is largely on an export basis. Commonly from 60 to 70 per cent of the catch is exported, the most important export being canned salmon to Great Britain and other parts of Europe. As even big fishing enterprises call for only a small number of laborers, the total number employed in all phases of the fishing industry is less than 85,000.

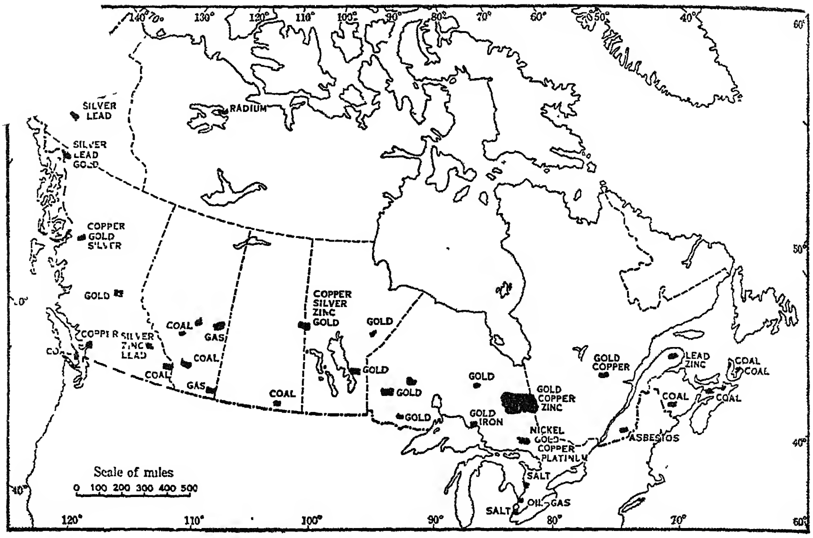


FIG. 220. Principal mineral areas of Canada

Mineral Products and Mining Areas. Among the countries of the world Canada commonly ranks first in the production of nickel, platinum, and asbestos; second in zinc and radium; third in copper, gold, and silver; fourth in lead; and about tenth in coal. In addition, it produces several other minerals, including petroleum and salt. In value the four leading minerals are gold, nickel, copper, and coal. Large areas in northern and western Canada have not been thoroughly prospected, so that new mining areas and even new minerals may be found in the future.

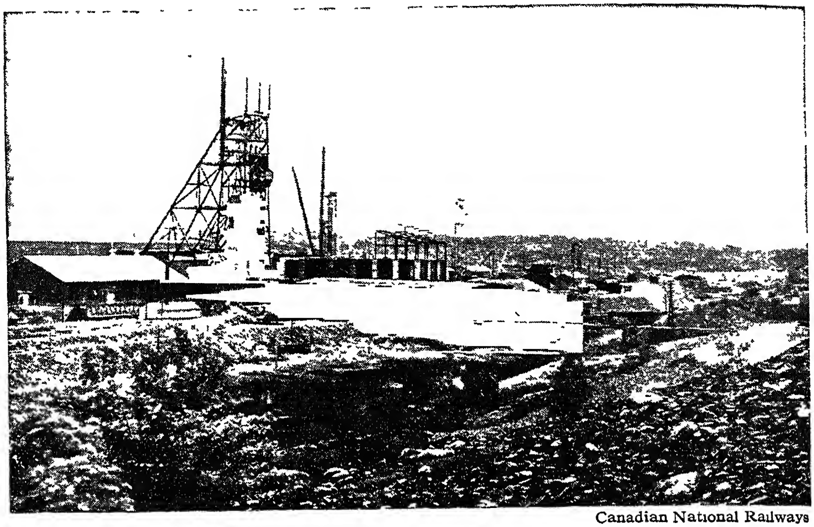
Canada's production of the great industrial minerals is small. No large deposits of iron, out of which machines are made, have been found. Of the mineral fuels which propel machines, Canada has great quantities; but the coal and most of the petroleum are in the wrong part of the country (Fig. 220). The manufacturing sections of the country are in the St. Lawrence Lowlands of Ontario and Quebec, whereas the coal is in Nova Scotia to the east and in Alberta and British Columbia to the west. It is cheaper, therefore, for Toronto, Hamilton, and Montreal to buy coal from near-by Pennsylvania and Ohio than to pay for the long haul from the coal fields of Canada. Ontario produces a little petroleum, but the big reserves are in Alberta and the Mackenzie Basin, again too far away.

Canada commonly produces more than 70 per cent of the world's asbestos. The mining area is in the St. Lawrence Lowlands east of Montreal (Fig. 220). Both open-cut and underground methods of mining are employed. Asbestos has a fibrous structure, and the longer fibers can be spun and woven or felted into a clothlike material which will not burn; consequently it is used to insulate electrical wiring, for brake linings and clutch fabrics, and to prevent the spread of fire. The shorter fibers go into shingles and corrugated sheets for building purposes and also are made into paper, millboard, and other noncombustible products.

The Laurentian area, sometimes called the "Canadian Shield," is the most important mineral-producing section of Canada (Figs. 213 and 220). It occupies more than half the country, and from it come most of the gold, silver, copper, and other metals. Much of the area is covered with a forest growth, and thus prospecting for minerals is a difficult job. Along the streams, however, the ancient rocks outcrop, and early prospecting was confined largely to the river valleys. Later, when railways were built westward from Montreal to Winnipeg, many of the railway cuts laid bare the surface of the old rock. In these cuttings some of the most important mineral deposits of the country were found.

Minerals have been discovered in many sections of the Laurentian area. Many of the deposits are in remote areas not reached by railways or roads. For a time the Flin Flon copper-silver-zinc-gold area on the border of Manitoba and Saskatchewan was in this class (Figs. 212 and 220). The deposits were found years ago; but the mines could not be worked until the district was reached by the Hudson Bay Railroad leading to Churchill on Hudson Bay. The recently opened radium mines on Great Bear Lake largely depend on air transport, radium being so rare and valuable that the high cost of transportation does not matter.

The most important mineral-producing districts of the Laurentian area lie between the Great Lakes and Hudson Bay. Of these the Sudbury nickel district near Georgian Bay is one of the most productive mining areas of the world (Fig. 221). The district produces over 90 per cent of the world's nickel; in fact, Canada virtually has a monopoly of this metal. In producing the nickel large quantities of copper, platinum, and some gold, silver, and zinc are obtained. The chief value of nickel is its ability to toughen steel, and conse-



Canadian National Railways

FIG. 221. Nickel mine at Sudbury, Ontario

quently it is in demand by steel, automobile, railroad, and aviation industries. The mines are at Sudbury, the nickel-bearing range extending for about 36 miles. At Copper Cliff, west of Sudbury, the ore is smelted and the nickel, copper, and other metals extracted. The nickel is refined at Port Colborne, on Lake Erie, and from there it goes to the United States and other world markets.

Canada's Water Power. The lakes and ponds of Canada cover approximately 230,000 square miles, an area larger than that in any other country. Many parts of this well-watered country are situated at considerable heights above the sea. The rivers which drain these upland lakes are marked by steady flow and by numerous rapids and waterfalls. Such conditions invite the construction of dams and the generation of power. At present the major production of electric power is in Quebec and Ontario. Those provinces also have the greatest amount of undeveloped power.

Early in this century it became evident that hydroelectric power would become a "key industry" in Canada, especially in the coalless provinces of Ontario and Quebec. Power and power sites became matters of public interest. In Ontario, for example, seven cities in the Hamilton area banded together to obtain cheap power. The resulting low rates soon attracted manufacturing concerns which make large use of electrical energy in their operations. This encouraged

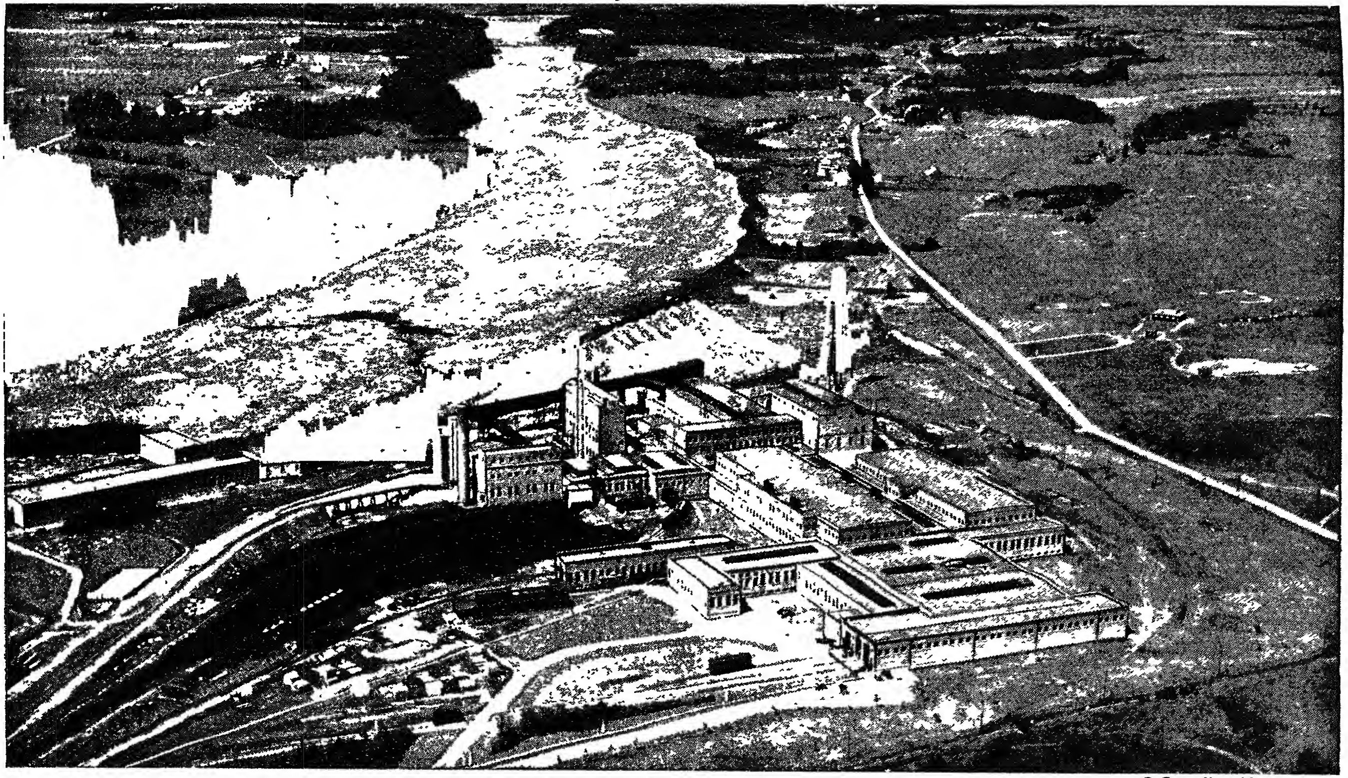


Fig. 222. A paper mill on the Saguenay River in the Province of Quebec

other cities and villages to join the movement toward public control of electric power. As a result the Hydroelectric Power Commission of Ontario was organized. This organization consists of more than 750 partner villages, cities, and farming areas banded into groups or systems in order to secure cheap electricity. The work of the commission has been so satisfactory that it supplies nearly all the cities and towns of the province as well as many small communities and rural areas. It aims to provide service at cost, and the rates are low. It generates power at more than 40 hydroelectric power plants, the largest being the Queenston-Chippawa development on the Niagara River.

Another need for hydroelectric power in Ontario and Quebec arose when pulp and paper mills were established (Fig. 82). Many mills were located along streams which tumble down the slopes of the Laurentian Upland into the St. Lawrence River (Fig. 222). It proved to be a relatively simple matter to harness the rapid streams for power, and in some cases so much power has been developed that the paper companies sell it to other local industries and even transmit power to Montreal and Quebec. Today most of the developed power in Canada is in Quebec and Ontario, and the average consumption for domestic use is twice as high as in the United States.

Manufacturing. In terms of manufacturing, Canada ranks second to the United Kingdom among the parts of the British Empire; and manufactured goods constitute its largest export to other parts of the empire. In point of value the United States is Canada's best customer for manufactured products, with wood pulp and newsprint paper the leading items.

Two distinct types of manufacturing stand out in Canada. The first and more important type uses Canadian raw materials and sells part of the products abroad. The metal smelting and refining industries, the slaughtering and meat-packing industries, and those industries that turn out pulp and paper, flour and feed, butter and cheese, are examples of this type of manufacturing. Commonly these industries are developed near to sources of supply or along routes to markets. The second type of manufacturing turns foreign raw materials into products for Canadian use. Crude petroleum, for example, is brought to Canadian ports and refined; and imported raw cotton is spun into yarn, and the yarn is woven into fabrics in Canadian mills. Rubber, iron ore, silk, coffee, tea, and spices likewise are manu-

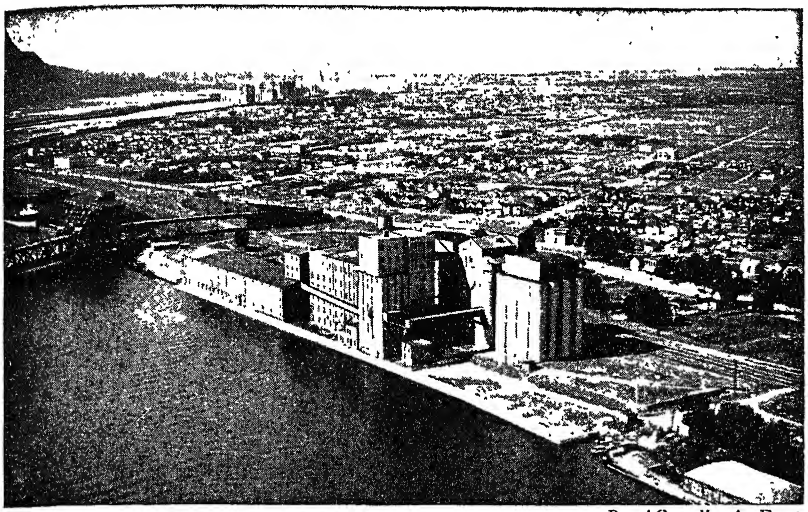


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FIG. 223. Flour mills at Fort William, Ontario

factured or packaged on Canadian soil. In general the plants engaged in the second type of manufacturing are located at the ocean ports—Halifax, St. John, Montreal, and Vancouver. Manufacture at seaboard saves cost in transportation, in that the heavy raw materials which have traveled cheaply by sea are made into more valuable finished products before being shipped inland by the more costly rail transportation.

Manufacturing in Canada, as has been stated, is largely a matter of manufacturing in Ontario and Quebec (Fig. 78). Of the more than 550,000 people employed in manufacturing in Canada, four fifths are employed in those provinces. The most important manufacturing districts are in and about Montreal and at the western end of Lake Ontario, with Toronto and Hamilton as the principal centers. The province of Quebec is notable because it has relatively few industries, but it has high rank in those. It produces nearly half the paper and pulp, 70 per cent of the cotton yarn and cloth, 40 per cent of the railway rolling stock, and nearly 60 per cent of the boots and shoes of Canada. The manufactures of Ontario are more diversified, being in this connection much like those of neighboring areas in New York, Pennsylvania, Michigan, and Ohio across the border.

As might be expected, automobile-manufacturing in Canada is confined to Ontario, with most of the plants in Windsor and asso-

ciated towns across from Detroit. The manufacture of agricultural implements shows much the same allegiance to Ontario. Hamilton is the iron and steel center, bringing iron ore and coal from the United States, the former by boat from the head of the lakes, the latter by rail or by rail and lake from Pennsylvania and Ohio. Electrical supplies, as might be expected, are manufactured in the Hamilton-Toronto area, its large demand for such supplies growing out of its cheap and widely distributed electrical power.

Manufacturing in Canada is associated in many ways with manufacturing in the United States. The Ontario section is a part of the American Manufacturing Belt (Fig. 78). Many Canadian factories are branches of older United States concerns. Many other enterprises are financed by American capital, and some have headquarters in New York. This is but natural; for manufacturing in the United States began on the Eastern Seaboard and in time expanded westward and southward. Expansion into near-by sections of Canada was encouraged by tariffs levied on goods imported from the United States. Manufacture in Canada, moreover, has proved an advantage in selling to other parts of the British Empire; because countries such as Australia give Canadian goods preference over those from the United States.

Transportation. Like the United States, Canada is big, being nearly 4000 miles from east to west. For the most part population is confined to the southern border, but even there the spread of population is not continuous (Fig. 67). An area which is almost wilderness separates the Maritime Provinces from Quebec, and more than 500 miles of unsettled territory lies between the agricultural and manufacturing regions of the St. Lawrence Lowlands and the agricultural areas of the Prairie Provinces. Moreover, only ribbons of settlement along the railroads in the Western mountains connect the prairies with the port of Vancouver. Naturally, with such a distribution of population in so vast an area, cheap transportation becomes a necessity.

Thus far in Canada the steam railway has been the principal instrument of transport, and Canada's 42,000 miles of railway, more than anything else, have bound the provinces into a nation. Although this great mileage gives Canada fourth place among the countries of the world in railway mileage (the United States, U.S.S.R., British India, Canada), the northern two thirds of the country is not

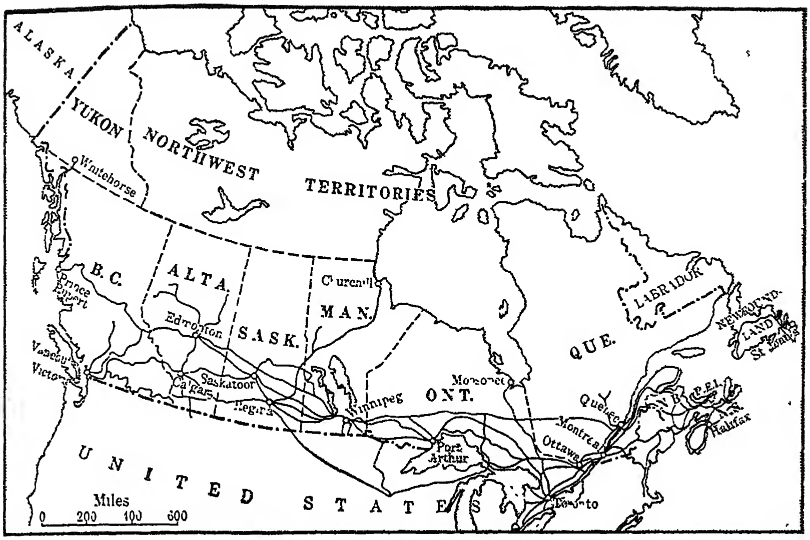

FIG. 224. The railroad pattern of Canada, showing the principal railroad centers

reached by railways (Fig. 224). Here, again, is a reason for the concentration of Canada's population in the southern part of the country. Today the railways are grouped into two great systems: the Canadian Pacific, a privately owned system, and the Canadian National Railways, operated by the government.

The waterways of Canada have been and still are much used for navigation. River craft now ply the Mackenzie, Yukon, and some of the other northern streams in the summer months. Vancouver has an ice-free water route to the sea via the Strait of Juan de Fuca, and a route to Alaska protected by offshore islands (Fig. 225).

The greatest waterway in Canada is made up of the Great Lakes and the St. Lawrence River. Ocean-going vessels of great size sail up to Quebec, at the head of the estuary, and freight vessels and smaller passenger vessels ply to Montreal, at the head of ocean-going navigation (Fig. 226). Between Montreal and Lake Ontario navigation is interrupted by rapids. Canals permit river steamers to pass these rapids, and the Canadian and the United States governments are considering a plan to deepen and widen the canals to admit ocean-going vessels. At Niagara Falls, between Lake Erie and Lake Ontario, navigation finds its greatest obstacle. As a result the Canadian government built the Welland Canal from Port Colborne on

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Fig. 225. Vancouver, British Columbia, showing the business section in the middle, a residential area at the right, and the port at the left

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Fig. 226. The port of Montreal, showing part of the business section of the city at the left

Lake Erie to Dalhousie on Lake Ontario. The use of the St. Lawrence River, however, is reduced by the fact that the river and the lakes are closed by ice in the winter. During the months when the river is blocked the traffic moves by rail from Montreal to St. John (New Brunswick), to Portland (Maine), or to the port of New York—ports open throughout the year.

In recent years interest in the use of the automobile has stimulated highway construction in Canada. Distances are long and people are widely distributed, however, and in this land of severe winters roads cost much to build and maintain. Most of the country east of Lake Huron is well supplied with all-weather roads, and roads are completed in some parts of the prairies. As yet no through road has been built north of Lake Superior, where rough land and the absence of people discourage highway building. A trans-Canadian highway is now under construction. When completed it will be one of the longest highways in the world.

Air transportation means much to Canada. Passenger and mail services connect the principal Canadian cities with the air lanes of the United States, and some air-mail services are operated entirely within the Dominion. In addition, airplanes operated by the government give a ready means of obtaining information about remote settlements and make it possible to send medical and other supplies to such outposts. Forest-fire patrols are maintained, air photographs are obtained for use in surveys and as base maps, and prospecting parties are flown quickly to remote areas to search for minerals. Hydroplanes are employed almost exclusively in all these services; for the thousands of lakes and streams furnish natural landing fields.

The Trade of Canada. Since early times the external trade of Canada has been carried on predominantly with the two great English-speaking countries, the United Kingdom and the United States. During most of the time the former has been the chief market for Canadian exports, but the United States has led in some recent years. Since 1883 Canada has bought more from the United States than from any other country (Fig. 227). This high rank of the United States in Canada's trade is due to nearness, to similar needs of remarkably similar people, and to the great variety of goods produced in the United States.

What does Canada get from other countries and what does it sell other countries? The answers to these questions are partly shown

Country	Percentage of Total Imports	Coun	Percentage of Domestic Exports
United States	58.1	United Kingd	41.5
United Kingdom	21 4	United States	34.1
Germany	1.9	Australia	2.7
France	1.2	Japan	2.6
British India	1.2	British South	1.9
Australia	1.2	Belgium	1.8
Barbados	0.9	Netherlands	1.5
Colombia	0.9	France	1.5
Japan	0.8	New Zealar	1.1
Netherlands	0 8	Newfoundla	1.0
Jamaica	0.8	Norway	0.7
Belgium	0.7	Germany	0.7

FIG. 227. Trade of Canada with leading co... in a recent year

Leading Imports	Principal Source	...	Principal Destination
Coal	United States	W npo	United Kingdom
Crude petroleum	Colombia and United States	Ne s m aper	United States
Automobile parts	United States	N	United States
Rolling-mill products	United Kingdom	V	United States
Fruits	United States	P ...oards	United Kingdom
Machinery (not including farm implements)	United States	I ada	United Kingdom
Raw cotton	United States	F	United States
Sugar and products	West Indies	Ae U... fined)	British Empire
Alcoholic beverages	United Kingdom	C	United Kingdom
Cotton goods	United Kingdom	ea, ar	United Kingdom
Woolen goods	United Kingdom	to the	United Kingdom
Rubber and products	Straits Settlements and Netherland India	Can:	United States

FIG. 228. Leading commodities in t... trade of Canada

in Figure 228. In the case of some ite... s coal and petroleum, Canada produces the commodity, bu... l parts of the country or not in sufficient quantity for its n... her cases the imports are not produced in Canada, and ... tire supply has to be imported. Citrus fruits, rubber, silk, ... cacao, and cane sugar are in this class. The leading export... in Figure 228, clearly suggest Canada's role as exporter, ... e production of raw materials and a few distinctive type... ctured goods for shipment abroad.

QUESTIONS

1. How many inches of precipitation are characteristic of each of the major surface feature divisions Canada (Fig. 213 and Plate I).

2. What are the prin al minerals produced in each division? Make a list of them.

3. Which are the no gricultural divisions?

4. Which division has ost of the hydroelectric power? Which two lead in manufacturing?

5. Where are the maj obstructions to navigation on the Great Lakes–St. Lawrence Waterway? W has been done to provide transport around these obstructions?

6. Where is the paper anufacturing belt of Canada (Fig. 82)? Out of what is newsprint made? ere is the major market for Canadian newsprint?

7. Why is there no hig y north of Lake Superior?

8. What are the leading ns in Canada's export trade? in its import trade?

9. What are the leadin untries with which Canada trades? Explain.

10. Why does Ontario i rt millions of tons of coal each year in spite of the fact that Canada contain ch coal?

EXERCISES

1. *Can and the United States*

a. Compare Canada and nited States in (1) size, (2) total population, (3) number of outlets to the nd (4) amount of farm land.

b. Canada's largest export United States is paper. Explain. The largest export of the United States to da is coal. Explain.

c. The United States exp al to Canada and also imports coal from Canada. Explain.

d. Much United States whe ported from Montreal, and much Canadian wheat is exported from New Explain, bringing out the wheat-producing areas concerned (pp. 237–238) s Vancouver export United States wheat? Explain.

e. Many French-Canadians ive in the United States. Tell where they live and why they live there (p

f. Some American manufac concerns have opened plants in Canada. Why is this logical?

g. Why are both Canada a United States interested in nickel and asbestos?

2. *Import trade of Canada*

a. Prepare a bar graph showing the percentage of total imports which Canada obtains from the countries listed in Figure 227. Let one inch represent 10 per cent. Your bar for the United States, therefore, will be nearly six inches long.

b. After examining Figure 228, write a statement about the nature of the imports from (1) the United States and (2) the United Kingdom. For each of the imports from the United States, tell from what section or sections of the United States the commodity is obtained.

3. *Export trade of Canada*

a. Prepare a bar graph for Canadian exports similar to the one you have prepared for the imports.

b. Write a statement about the nature of Canadian exports to the United States and the United Kingdom. Tell also the section or sections of the United States to which each export to the United States probably goes. If you think any of the exports go to all parts of the United States, make that clear.

4

WESTERN EUROPE

CHAPTER XXIX

WESTERN EUROPE AND ITS PLACE IN COMMERCE

Leadership of Western Europe. Western Europe is distinguished by leadership in nearly all phases of world affairs. It is a great commercial region. It is a great manufacturing region. It ranks high in agriculture. It has much influence on the acts of governments in all parts of the world.

Commercial leadership. To a remarkable degree Western Europe draws world commerce to itself. The exports and imports of its fourteen countries amount to nearly as much as those of all the rest of the world combined (Fig. 229). The busiest ocean lanes lead to its shores, and half the world's ships sail under Western European flags.

Western Europe has good reason for its interest in commerce. It contains twice as many people as live in the United States, though it is less than half as large. The average population density slightly exceeds that of Pennsylvania, and the region contains many large cities which manufacture for world-wide markets. Having a dense population and many large industries, the region needs more foods and raw materials than it produces, and it lacks some of the many resources needed by modern industries.

Leadership in manufacturing. Several lines of evidence point to Western Europe as a leader among manufacturing regions.[1] In the first place, its early inventors made steam the servant of man, and as a result it was the first region to use machinery for manufacturing. Second, the region is a large user of power, for it contains nearly half the world's developed water power and produces nearly half the coal mined in the world. Third, its factories and workshops employ more than twice as many workers as do those of the United States and Canada together. High rank in certain major manufacturing industries furnishes a fourth line of evidence. For example, Western Europe contains more than half the world's cotton-spinning spindles and manufactures more than 40 per cent of the rayon, aluminum, pig iron, and steel produced in the world.

High rank in agriculture. Western Europe is a leader in agriculture. It ranks high as a cereal-growing area, leading the world in

[1] Most countries do not publish the total amount of manufacturing done within their boundaries.

Countries	Imports	Exports
	Per Cent of World Total	*Per Cent of World Total*
Belgium and Luxembourg	3.2	3.2
Denmark	1.5	1.5
France	6.9	4.5
Germany	8.5	9.8
Ireland (Eire)	0.9	0.5
Italy	2.0	1.9
Netherlands	2.9	2.3
Norway	1.1	0.8
Portugal	0.4	0.2
Spain	1.4	1.0
Sweden	1.9	1.9
Switzerland	1.7	1.3
United Kingdom	19.1	12.1
Total Western Europe	51.5	40.9
World total	100 per cent	100 per cent

FIG. 229. Share of Western Europe in international trade of world in a recent year. (For locations of countries see Plate V)

yield of wheat, barley, and rye per acre, and devoting more land to each of these grains than does the United States. It is a great horticultural region, growing the orchard fruits and garden vegetables of middle latitudes, leading the world in vineyard culture, and producing large quantities of citrus fruits. It is a great livestock region, raising more cattle, sheep, and pigs than does the United States. But the region needs more wheat, meat, fruit, wool, and butter than it produces; hence it is a great market for such commodities.

Political power. Western Europe has much influence in the political affairs of the world. Four of its countries—the United Kingdom of Great Britain and Northern Ireland, Germany, France, and Italy—are among the world's great powers, ranking high in population, manufacturing, and commerce. Belgium and the Netherlands take high rank in everything but size. Importance in commerce (Fig. 229) adds to the political influence of the countries of Western Europe, for exporting countries are anxious to have the good will of nations that offer large markets.

Empires represent political power, and eight nations of Western Europe hold colonies in other parts of the world. The British, French, Italian, Belgian, Dutch, Portuguese, Spanish, and Danish empires

together cover more than 40 per cent of the world's land area and contain more than 40 per cent of the world's population. Thus a large part of the world is tied politically to Western Europe (p. 682). Though many of the colonial peoples manage their own affairs, they are influenced by special trade privileges and by loyalty to the mother countries.

The Heart of Western Europe. An arm of the Atlantic, extending eastward to the Baltic shores, divides Western Europe into two parts. Scandinavia lies to the north, and a much larger division extends south to the Mediterranean Sea (Plates V and VI). The southern division, consisting of Britain and its Continental neighbors, has the larger population and is the more active in world affairs. Mountains form the backbone of this division, the surface rising in gradual slopes from the Atlantic and Baltic shores to elevations of almost three miles in the Alps, and then dropping by steep and rugged slopes to the Mediterranean. World leadership belongs particularly to the broad north-facing slope, which includes a low plain bordering the Atlantic and the Baltic Sea and a broad belt of hill country between the coastal lowland and the Alps (Fig. 230). Commercial leadership, leadership in manufacturing, and political power are concentrated there in an east-west belt placed midway between the northern and southern limits of the region. There is the heart of Western Europe.

Natural Wealth a Foundation for Commerce. The world importance of Western Europe rests upon skillful utilization of land and other resources. High density of population (Fig. 231) suggests an area of great natural wealth, and nature did indeed endow the region generously with land level enough for cultivation, with humid climate, with forests, and with a variety of minerals. The intelligent work of people has built great industries and rich commerce upon the foundation of natural wealth. People and industries are spread unevenly over the region, however, and this fact reflects an uneven distribution of natural resources.

Wealth of hill country and plain. The heart of Western Europe is rich in farm land having an annual rainfall of more than 20 inches and a frost-free season of five months or more (Figs. 232 and 233). Both hill country and plain have forest soils, but farmers obtain large yields by using skillful methods and generous amounts of fertilizer. Much low-lying land near the North Sea coast has been reclaimed in the Netherlands, Belgium, France, eastern England, and north-

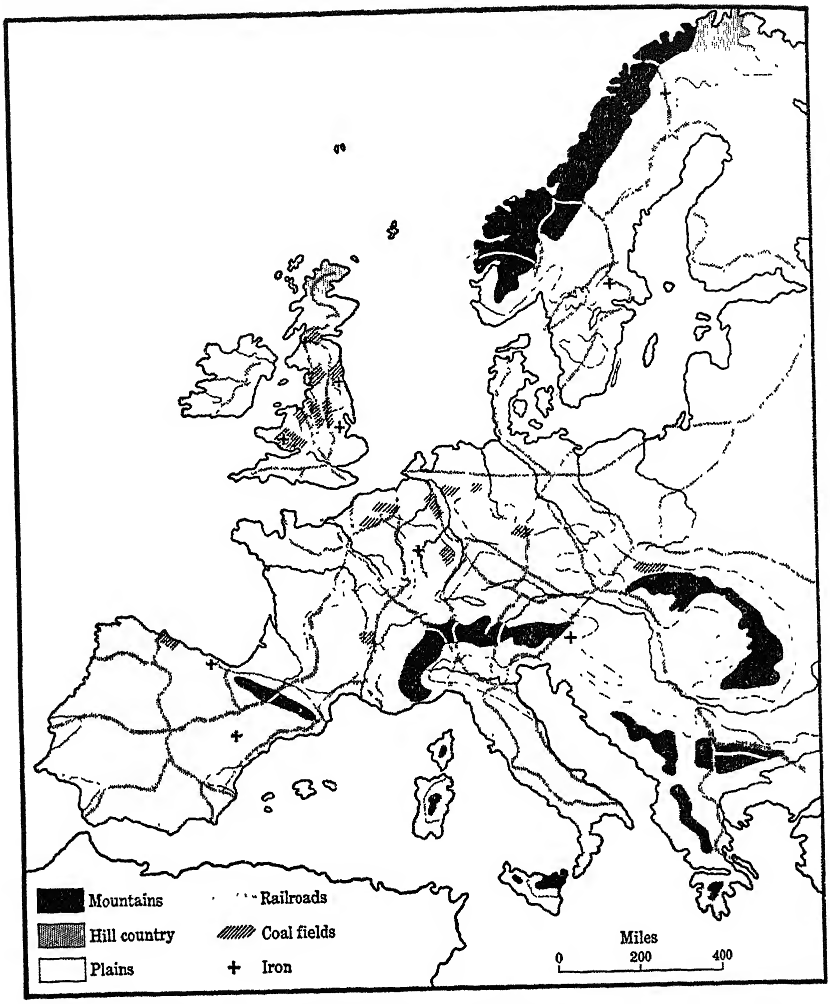


FIG. 230. Major land forms and principal coal fields of Western Europe

western Germany (Fig. 234). The work continues, for farm land in the world's greatest market region has high value.

The principal manufacturing belt of Western Europe occupies the strip of country where hill country meets plain (Figs. 235 and 230). It is largely responsible for the leadership of Western Europe in commerce. The Manufacturing Belt stretches from the British Isles across the Rhine Delta and about 800 miles into the Continent. It is an area of many interests. Agriculture finds favorable conditions, for the val-

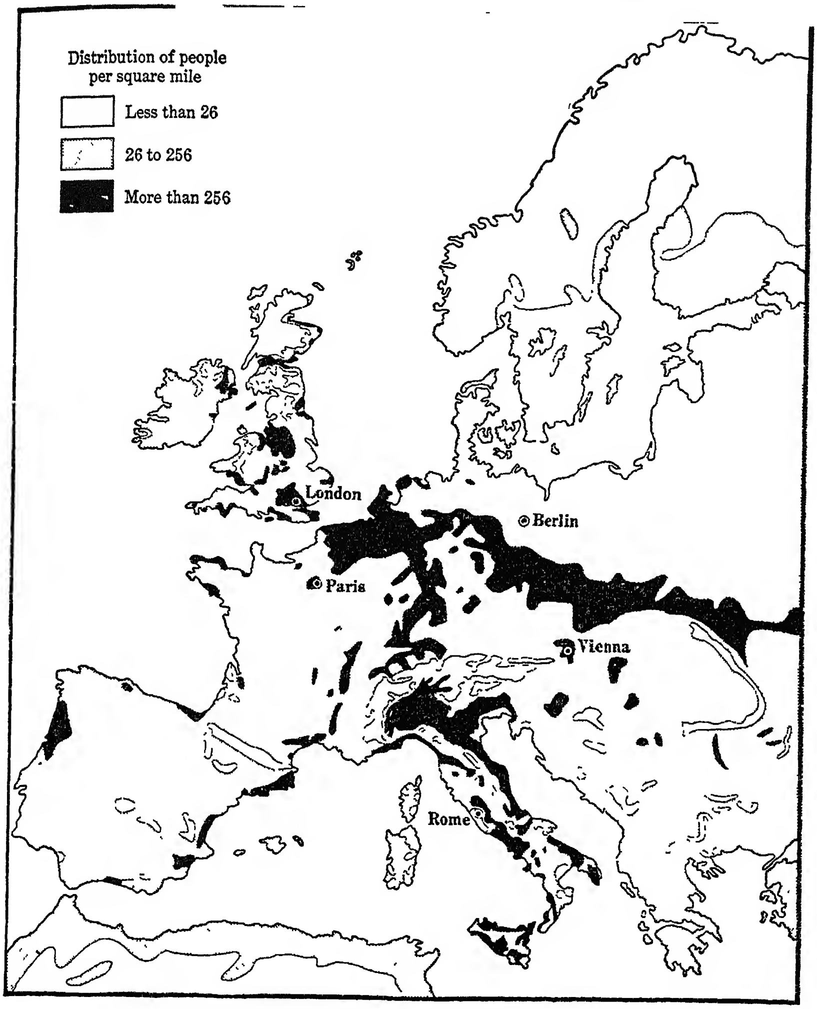


FIG. 231. Distribution of population in Western Europe

ley floors are broad, most of the hills have low summits and gentle slopes, a relatively large proportion of the soil is fertile, and the dense population furnishes a big market. The margin of the hill country is rich in coal, iron ore, potash, salt, and potter's clay. It has smaller deposits of zinc, lead, and copper. Manufacturing industries utilize the mineral resources and feed the streams of commerce. Trade is favored by a central location in Western Europe, by nearness to the sea, and by lowland routes to Eastern Europe. Manufacture and com-

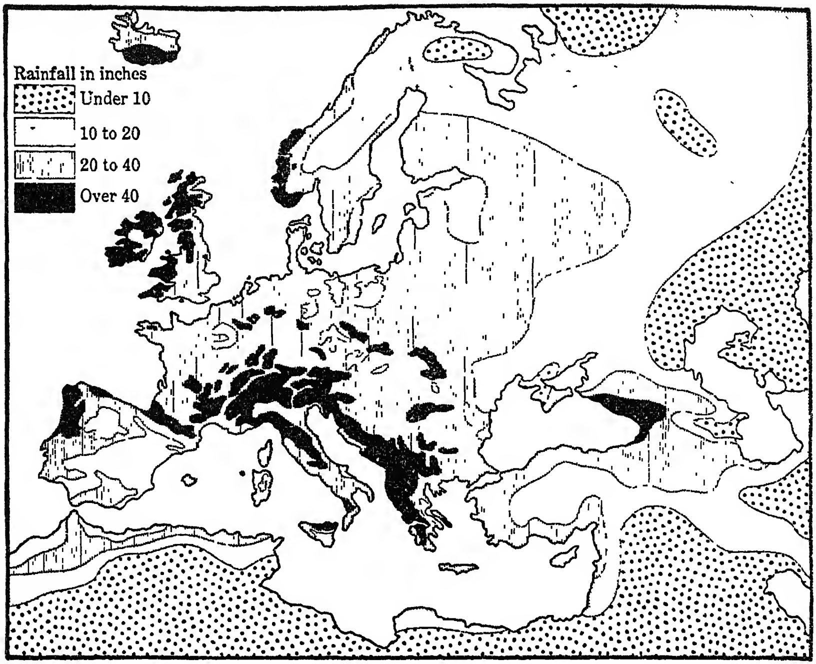


Fig. 232. Average annual precipitation in Europe

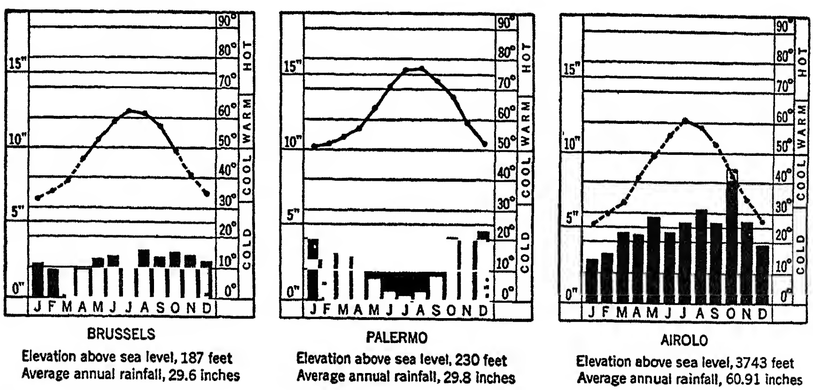


Fig. 233. Temperature and precipitation at Brussels (Belgium), Palermo (Italy), and Airolo (Switzerland). The climate of Brussels is fairly typical for Western Europe north of the Alps, Palermo is in a citrus-fruit area, and Airolo is at the southern end of St. Gotthard Pass (Fig. 267)

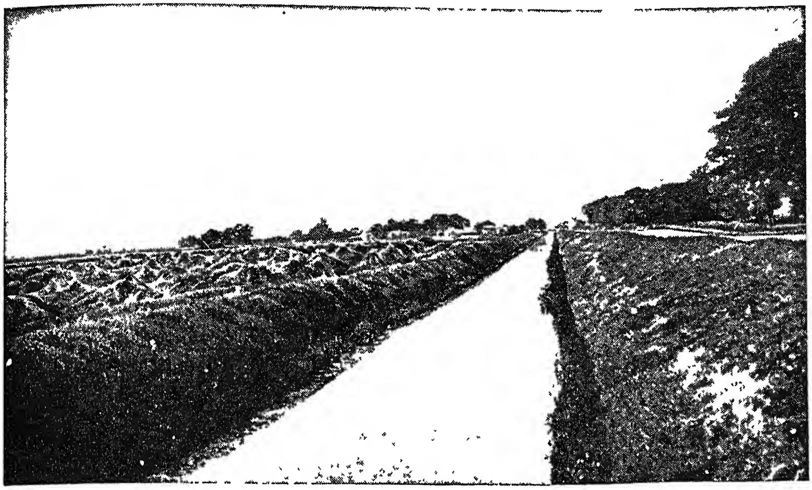


FIG. 234. Reclaimed land about one hundred miles north of London. Much low-lying land in this area has been reclaimed by methods similar to those used in the Netherlands

merce have stimulated the growth of cities, and the needs of city people in turn stimulate agriculture and manufacturing.

Resources of Scandinavia. Scandinavia contributes much to the life and trade of Western Europe. The well-settled area of southern Sweden (Fig. 231) supports a dense population and produces butter and pork for export. The Scandinavian upland, because of its extreme northerly location, supports few people; but it receives heavy precipitation and furnishes a wealth of water power. Its forested slopes yield regular supplies of lumber for use in the Manufacturing Belt, and Scandinavian mills export large quantities of wood pulp and paper. The upland also has a variety of ore deposits. Large quantities of Swedish iron ore go to blast furnaces in the Manufacturing Belt, and the best of the ore is highly prized for special steels. Fishing banks near the rugged Norwegian coast are an important source of food for Scandinavia and the rest of the region. Fish and forest products account for nearly half the exports from Scandinavia.

Resources of Alpine belt. A lower average population density shows the southern mountain belt to be poor in resources as compared with the heart of Western Europe (Fig. 231). Yet the Alps form a useful area, controlled by Switzerland, Germany, Italy, and France.

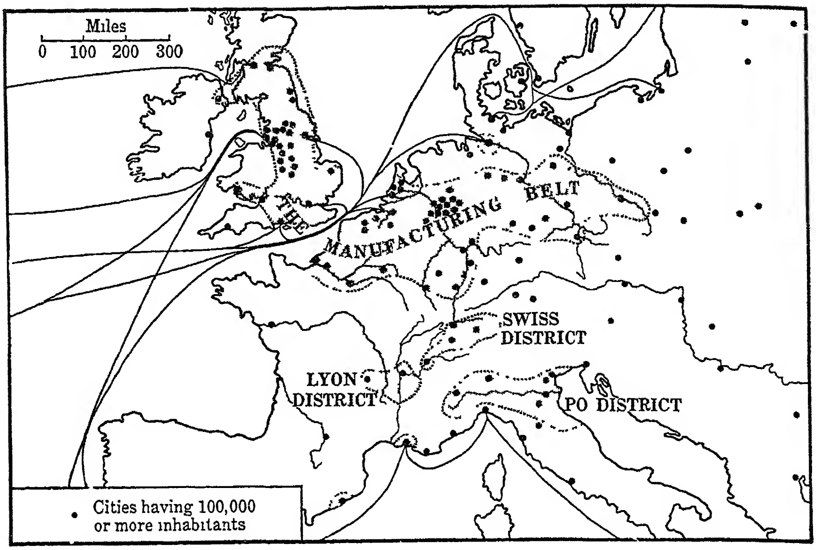


FIG. 235. The European Manufacturing Belt

Cool summers and magnificent mountain scenery attract many tourists. The mountains receive heavy precipitation (Figs. 232 and 233), and many streams flow down steep slopes to form the Rhine, the Rhône, the Po, and other rivers. Humid climate favors the growth of forests and grass; farms and villages cluster in valleys with level floors (Fig. 236); and swift streams furnish power. Manufacturing districts on the borders of the mountain belt (Figs. 235 and 230) utilize the power of mountain streams, employ many people from rural villages, and contribute to the trade of Western Europe.

Resources of Mediterranean border. Between the southern mountain zone and the Mediterranean is an irregular belt consisting of hill country and small plains. For a rugged area it has a large crop acreage and a dense population. The largest areas of fairly level land are the Spanish upland and the Plain of the Po. Elsewhere mountains stand near the sea and extend rugged spurs to the shore, leaving room for only small bits of lowland. The Mediterranean border is mainly agricultural, but much of the cultivated land consists of terraced hill slopes (Fig. 237). The hill country has some valuable mineral resources—mercury, bauxite (aluminum ore), iron ore, sulphur, and others; and some of the Mediterranean ports are important commercial and manufacturing cities, notably Marseille and Barcelona.

Burton Holmes, from Ewing Galloway

Fig. 236. Rural village in Rhône Valley above Lake Geneva, Switzerland. Though mountains on both sides of the valley rise to elevations of two or three miles, the valley bottom is less than two thousand feet above sea level. Meadows, grainfields, gardens, vineyards, and orchards spread over the broad valley floor, and vineyards also occupy any of the sunny south-facing lower slopes that are gentle enough for terracing

The outstanding resource of the Mediterranean border is a climate characterized by longer and hotter summers, more clear weather, and milder winters than characterize the climate of the area north of the Alps (Fig. 233). Mild and sunny winters attract many tourists southward to Mediterranean seaside resorts. The long frost-free season and the absence of severe winter frosts enable farmers in many lowland areas to get two or three crops from the same field within the year and to grow special crops, such as oranges, that do not thrive north of the Alps. Agriculture is planned to serve two major purposes —to feed a dense local population and to furnish horticultural specialties for the Manufacturing Belt.

Lack of some resources a spur to trade. Though richly endowed, Western Europe lacks some resources that modern man finds useful, and the search for commercial treasure has taken Europeans to the ends of the earth and the isles of the sea. For example, Europe does not extend into low latitudes: hence emigrants have gone abroad to

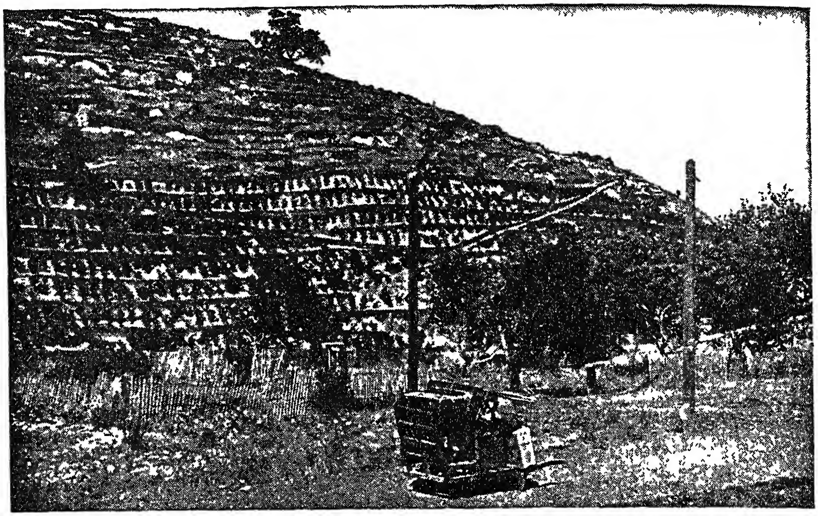


FIG. 237. Terraced vineyard land near the Mediterranean coast of France

grow sugar cane, coffee, rubber, and other tropical crops. Furthermore, only small areas near the Mediterranean have summers hot enough and long enough for cotton and corn, of which the region uses much. Supplies of some minerals—tin, copper, and petroleum, for example—are small in comparison with the needs of industries. Poverty in petroleum greatly handicaps Western Europe in this day of automobiles, airplanes, and oil-burning ocean vessels, but it encourages trade with oil-producing areas. Thus commerce is stimulated both by the wealth of the region itself and by its lack of some resources that other regions have.

Mainspring of Commercial World. To a great extent Western Europe keeps the streams of commerce moving. Its trade concerns both near-by and distant regions, and many commodities are produced in oversea regions because Western Europe will buy. For example, a few years ago an unusual demand in Western Europe led to a great increase in the wheat acreage of North America and Australia; later there came about a decrease in the American wheat acreage, due to hard times in Western Europe.

Where Western Europe buys. Western Europe consumes products from all parts of the Commercial World. It buys wheat, meats, and wool from agricultural and grazing regions that produce more than enough for their own needs. It buys tin from Bolivia and Malaya, gold

Groups of Countries	Value of Total Exports in a Recent Year	Per Cent to the United States	Per Cent to Western Europe	Per Cent to Eastern Asia
Finland, Baltic States, and Poland	$445,000,000	7	75	1
Hungary and Rumania	295,000,000	2	76	—
Greece, Turkey, and Bulgaria	214,000,000	10	74	1
Soviet Union	272,000,000	10	63	10
Egypt and French North Africa	439,000,000	3	82	3
China and Japan	978,000,000	23	13	—
Netherlands Indies and British Malaya	707,000,000	24	34	10
Philippines	148,000,000	80	9	7
India and Ceylon	769,000,000	10	49	14
Australia and New Zealand	701,000,000	5	72	12
British South Africa	157,000,000	4	67	7
Argentina, Chile, and Uruguay	713,000,000	14	65	2
Brazil	320,000,000	39	46	4
Ecuador and Peru	98,000,000	23	47	4
Colombia and Venezuela	286,000,000	31	12	—
Central America	51,000,000	62	32	—
Mexico	215,000,000	61	28	2
Cuba	155,000,000	79	18	—
United States	2,419,000,000	—	35	11
Canada and Newfoundland	959,000,000	35	50	3

FIG. 238. United States, Western Europe, and Eastern Asia as markets for the exports of selected groups of countries

and diamonds from Southern Africa, and petroleum from Venezuela and Iraq. Western Europe is the great market for the surplus products of Eastern and Southeastern Europe (Fig. 238); it takes about a third of the exports from the United States; it competes with the United States and Japan for commodities produced in the Orient; and it buys more from Canada, Middle Latitude South America, and Australasia than does any other region.

Where Western Europe sells. Exports from Western Europe, consisting largely of manufactured goods, find large sale in countries without highly developed manufacturing industries. Nevertheless, the leading customer of Western Europe is the United States, itself a manufacturing country. Of the exports shipped to countries outside Western Europe, nearly half go to four great areas: (1) the United States and Canada, (2) Eastern and Southeastern Europe, (3) Mediterranean Africa, and (4) Tropical Asia. Other areas that make purchases of considerable importance are Australasia, Middle Latitude South America, and British South Africa.

Moving the goods of commerce. The people of Western Europe take the responsibility for moving the goods of commerce to and from their shores. It is for this reason that they operate half the world's ships. It is for this reason that British and French companies operate railways in India, Africa, and South America. The commercial fleets of Western Europe consist of a variety of ships, including both large and small craft, dingy coal-carrying freighters, oil tankers, ventilated fruit boats, refrigerator ships, and luxurious passenger liners. They collect and deliver goods in all parts of the Commercial World, and they handle traffic between oversea regions as well as to and from Western Europe.

Transportation Routes and Facilities. Western Europe ranks with the United States in the abundance of its transportation facilities and services (Fig. 28 and p. 50). Closely spaced transportation lines form an elaborate system the branches of which reach both cities and rural districts. The system includes transportation by sea, river, canal, rail, highway, and air.

Sea position and ocean lanes. Western Europe has been called, very appropriately, "Europe of the Sea." Lying between the Baltic and the Mediterranean, it can be approached by sea from three sides, and no point in the region is more than 500 miles from the coast. Because of its sea position, not only does it find ready means of satisfying its own wants but it also acts as a middleman for interior sections of the Continent in their dealings with oversea regions. The great ports facing the Atlantic handle traffic for areas far beyond the countries in which they are situated.

The principal ocean routes of the world focus on the English Channel, which, together with the narrow southern part of the North Sea, forms a waterway known as the Narrow Seas (Figs. 28 and 239 and Plate VI). This waterway cuts the Manufacturing Belt into a British and a Continental division. It also forms a route into the heart of the Manufacturing Belt and leads to both British and Continental ports. The meeting of ocean highways with the land routes of Europe brings much traffic to the Narrow Seas ports.

Commercial importance of the Narrow Seas. The Narrow Seas waterway is, in effect, the main business street of Western Europe, and frontage there is highly prized by the nations. Because Belgium and the Netherlands occupy a coveted coastal strip, they have an importance out of all proportion to their size. For the same reason, they

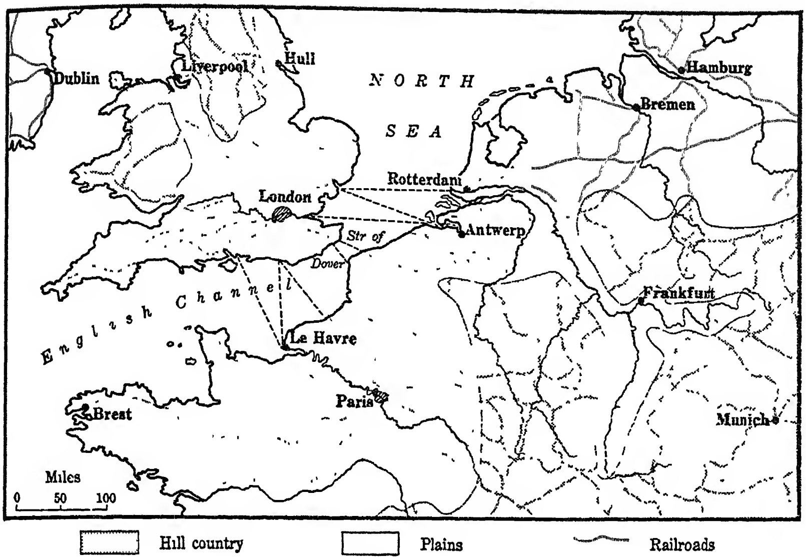


FIG. 239. The Narrow Seas waterway and the Continental Seaboard of Western Europe

have been frequent sufferers in the wars of the stronger European nations. The commercial importance of the Narrow Seas waterway is suggested by the number of world-famous ports on its shores. London, Rotterdam, and Antwerp rank among the world's leading six ports, a half dozen lesser ports take important parts in oversea commerce, and a score of ferry towns handle traffic between the British and Continental divisions of the Manufacturing Belt.

River and canal transportation. Western Europe makes much use of rivers and canals for transportation (Fig. 240). The Seine, the Rhine, the Elbe, and the Oder rivers cross the Continental division of the Manufacturing Belt, and many broad estuaries lead from the sea into the British division. Rivers have been improved to such an extent that they are in part artificial waterways, and numerous canals have been constructed to connect river routes. Barges on rivers and canals carry a large share of the bulky traffic, such as iron ore, grain, and coal.

The commercial importance of rivers in Western Europe may be gathered from the fact that the leading ports mark the junction of river routes with ocean highways. London, the first of the world's great ports, stands at the head of deep-water navigation on the Thames

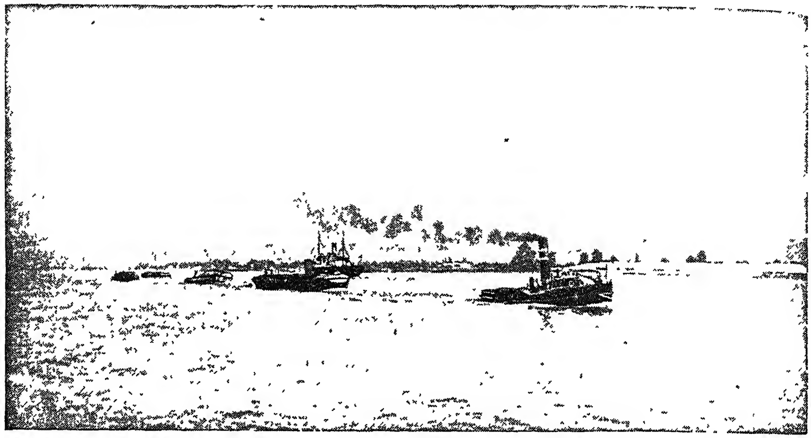


Fig. 240. Seine traffic between Le Havre and Rouen (Fig. 260 and Plate VI). Near this point, as at many other points along the route, river traffic meets rail and highway traffic from industrial villages in tributary valleys. Beyond the foremost barge is an ocean-going vessel

estuary. Le Havre, on the Seine estuary, is the principal Atlantic gateway into France. Rotterdam and Antwerp hold favored positions on the Rhine Delta, and their business concerns a large area extending into Germany and up the Rhine to Switzerland. The foreign trade of a large section of Germany flows through Hamburg on the Elbe. Nature provided a generous number of navigable streams, and man has adapted them to his use.

The railway pattern. The railway pattern of Western Europe emphasizes the importance of the Narrow Seas entrance (Fig. 239). Main-line railways from the major ports lead inland and focus on the principal cities, the outstanding railway centers being London, Paris, and Berlin. London is connected with the Continent by several rail-ferry lines which carry a large amount of traffic. Thus the Narrow Seas waterway, while it divides Western Europe, also unites the two portions through the bonds of trade. From Narrow Seas ports and from Paris, important lines extend eastward via Berlin and give communication with the agricultural countries of Eastern Europe. Other lines lead southward from Paris to Spain and Italy (Plate V) and southeastward from Berlin to Istanbul and Black Sea points.

Highways and air routes. Western Europe vies with the United States in making use of the motor vehicle and the airplane for transportation. A close network of excellent motor roads spreads over the

region. Commercial air routes, offering passenger and fast-express services, reach all the great capitals and the principal commercial cities. Travel between business centers is hampered, in many cases, by water bodies too wide to be bridged, and the air route does away with the delay caused by changing from train to boat.

Commercial importance of the Mediterranean. The Mediterranean is the great highway of Southern Europe. It gives Italy and Southern France an outlet to Atlantic commerce, and it provides a short cut to the Orient by way of Suez. It offers a water route for bringing wheat to the Manufacturing Belt from Rumania and the Soviet Union, oranges from Spain and Italy, and currants from Greece. The Mediterranean opens to European manufacturers and merchants the trade of Northern Africa. Cotton from Egypt, wheat, wine, and garden vegetables from farms in northern Algeria, and phosphate rock from Tunisia are brought by water to Western Europe. In return, products of European factories, such as cotton goods and kerosene, are carried to the African coast, and many of them eventually find their way to oases in the Sahara.

QUESTIONS

1. In general, is the population of Western Europe denser than that of the United States, less dense, or about the same? (Compare Figs. 67 and 231.)

2. What facts given in Chapter XXIX prove that Western Europe is a great manufacturing region? a great commercial region? a great agricultural region? a region of political power?

3. What advantages for manufacturing has the heart of Western Europe?

4. Where are the principal coal fields of this area with reference to mountains, hill country, and plain (Fig. 230)?

5. What other valuable resources has the strip of coal-bearing land that stretches eastward from the Narrow Seas? What bearing have these resources on the population density of the belt?

6. Where is the European Manufacturing Belt with reference to mountains, hill country, and plain? with reference to the belt of very high population density?

7. Why are steel manufacturers in the European Manufacturing Belt interested in the resources of Scandinavia?

8. In what countries are the principal steel districts of the European Manufacturing Belt (Fig. 254)?

9. How does the average annual precipitation of the Alpine mountain belt differ from that of the plain that borders the Baltic? from that of the Mediterranean border (Fig. 233)?

10. How do summer temperatures in the Alps compare with those of the lowland near the Narrow Seas? with those of Mediterranean lands?

11. How does summer precipitation north of the Alps compare with that of Mediterranean lands?

12. For what two reasons is the climate of the Mediterranean border of interest to London people?

13. How do the water-power resources of the Alps compare with those of the heart of Western Europe? Why?

14. Both the Alpine belt and the Mediterranean border attract tourists. In what ways do the attractions of the two areas differ? Which probably has the greater share of tourist trade in summer? in winter?

15. Which of the principal ocean routes lead to Western Europe (Fig. 28)? How many of these lead to the Narrow Seas?

16. Of what importance is the fact that rivers flow across the European Manufacturing Belt?

EXERCISES

1. *Western Europe as a market (Fig. 238)*

Prepare a map to show the relative importance of Western Europe and the United States as markets for exports from different parts of the world.

a. Color red on an outline map of the world all countries that send 51 per cent of their exports or more to Western Europe. Color blue those sending 51 per cent or more to the United States. Color green those sending between 20 per cent and 50 per cent to each, the United States and Western Europe.

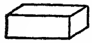
b. Study your map and be prepared to discuss what the map shows, including the following points: (1) parts of the world that sell principally to Western Europe; (2) parts that sell principally to the United States; (3) areas for which the two great markets are of nearly equal importance.

c. Try to interpret the facts which you have discovered in your map. Decide, for example, (1) in what areas the direction of trade may be influenced by political ties, (2) in what areas distance favors trade with Western Europe, and (3) in what areas distance favors trade with the United States.

2. *The world's supply of steel*

The amount of steel manufactured in the world during a recent year was estimated at 135 million tons. The output of the principal producing countries was, in millions of tons, as follows: Belgium 4, Canada 1, France 8, Germany (including Austria and Czechoslovakia) 23, Italy 2, Japan 6, Luxembourg 3.

Soviet Union 18, Sweden 1, United Kingdom 13, United States 52. All other countries together produced 4 million tons.

Prepare a multiple-unit graph to show the relative importance of (1) the United States and Canada, (2) Western Europe, and (3) the rest of the world in the manufacture of steel. Let one block () stand for 10 million tons, and use a shorter block for a remainder of less than 10 million tons. Your graph will have three lines, and the first line will look like this:

United States and Canada 

When you have finished your graph, make a statement about the relative importance of the three groups of countries.

3. *An Alpine valley*

Study Figure 236 and be prepared to talk on the following points: (1) nature of the land surface where the village is built, (2) nature of surface beyond the village, (3) indications that some of the village people grow crops, (4) indications that farms probably are small, (5) evidence as to whether the village people grow fruits, (6) probable attractions for tourists.

CHAPTER XXX

COMMERCE AND INDUSTRY OF BRITAIN

1. *Britain's Place in Commerce*

Britain is a great world market and depends on sea-borne trade for its very life. Its crop land cannot produce enough to feed its 47 million people, of whom more than 35 million live in cities. The people long have been accustomed to imported foods, which are paid for mainly by exporting manufactured goods. Manufacturing, trade, and transportation furnish more than three fourths of the jobs open to workers. If the sea-borne trade of Britain were cut off, people in many parts of the world would have difficulty in selling their export products, and in Britain there would soon be a shortage of food and of raw materials for factories.

Gateways into Britain. No point in Britain is far from a seaport. A half dozen navigable estuaries indent the east coast and another half dozen are cut into the west coast, each estuary having its own port or group of ports (Fig. 241). Five of the estuaries together carry 80 per cent of Britain's sea-borne trade (Fig. 242). London, looking eastward along the Thames waterway, has much business with the Continent, and the American trade focuses on Liverpool. In addition to the major estuary gateways, many inlets and small bays furnish protected harbors where ships may load or unload. Although long-distance trade centers at the few major ports, an abundance of ports is convenient for the many small vessels that trade with the Continent and Ireland.

The Thames Gateway. Stand for a few moments amid the throngs on London Bridge (Fig. 243) and you may look upon the meeting of inland and sea-borne traffic, for ocean vessels can ascend the Thames to that point. West of the bridge the river is open to coal barges and other shallow-water craft, but eastward lies the busy Thames estuary, bearing ships from many lands (Fig. 244). For a distance of 9 miles, docks and wharves line the banks and lighters ply between ships and landings. Farther on there are occasional railway terminals, and the Port of London continues to the deep-water docks of Tilbury, 25 miles from the city.

North of the river the bridge leads into the section known to Londoners as "the City." There, at the head of navigation on the Thames,

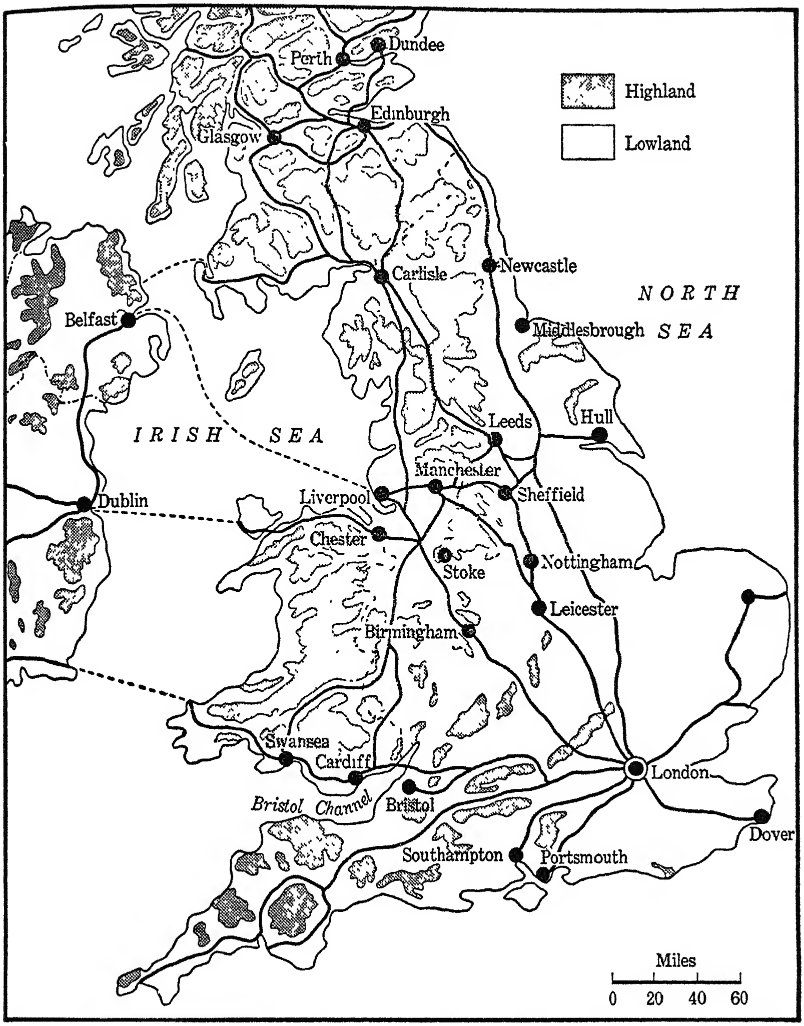


Fig. 241. Land forms, principal cities, and principal railways of Britain

is the heart of the British Empire, the time-honored business center of the Commercial World. Seven of the City's principal streets meet at the corner where the Bank of England and the Royal Exchange face each other across Threadneedle Street; and at the "tube" station beneath the surface, trains arrive and depart every few minutes. It would seem that all roads lead to the City; and, in fact, men from every country in the world mingle among the crowds that throng the

Principal Gateways into Britain	Value of Trade
Thames estuary	
London	£510,000,000
Mersey estuary	
Liverpool	297,000,000
Manchester (canal from Mersey)	59,000,000
Humber estuary	
Hull	82,000,000
Grimsby	17,000,000
Goole	14,000,000
Bristol Channel	
Bristol	29,000,000
Swansea	17,000,000
Cardiff	13,000,000
Newport	6,000,000
Gloucester	2,000,000
Clyde estuary	
Glasgow	50,000,000
Greenock	2,000,000
Trade via the five estuaries	1,098,000,000
Total of British commerce	1,349,000,000

FIG. 242. Commerce (imports plus exports) of major British estuary gateways in a recent year

sidewalks of the world-renowned commercial center, all brought to London by the business of international trade.

London's Many-Sided Role in British Trade. London plays a many-sided part in British commerce. It ranks first as an importing port, and it handles an increasing share of the export trade. It is a great world entrepôt. It takes a prominent part in domestic trade. Its commerce, together with the vast population of the city and its suburbs, has led to an important development of manufacturing. As a banking center its influence is felt throughout the Commercial World. As the capital of an empire it does much to stimulate British trade.

Greatest importing port. London's imports are more than double those of Liverpool, Britain's second great port, although in the export of British goods London is surpassed by Liverpool. London receives bacon, butter, and eggs from Denmark and the Netherlands; chemicals and knit goods from Germany; wine and early vegetables from France; lumber and wood pulp from Scandinavia. It buys tea, spices, rubber, and silk from the Orient. In fact, it handles more than 40 per cent of all British imports, reckoned on the basis of value. This fact does not reveal the full importance of the world's greatest commercial center, however. Many shipments intended for London, especially

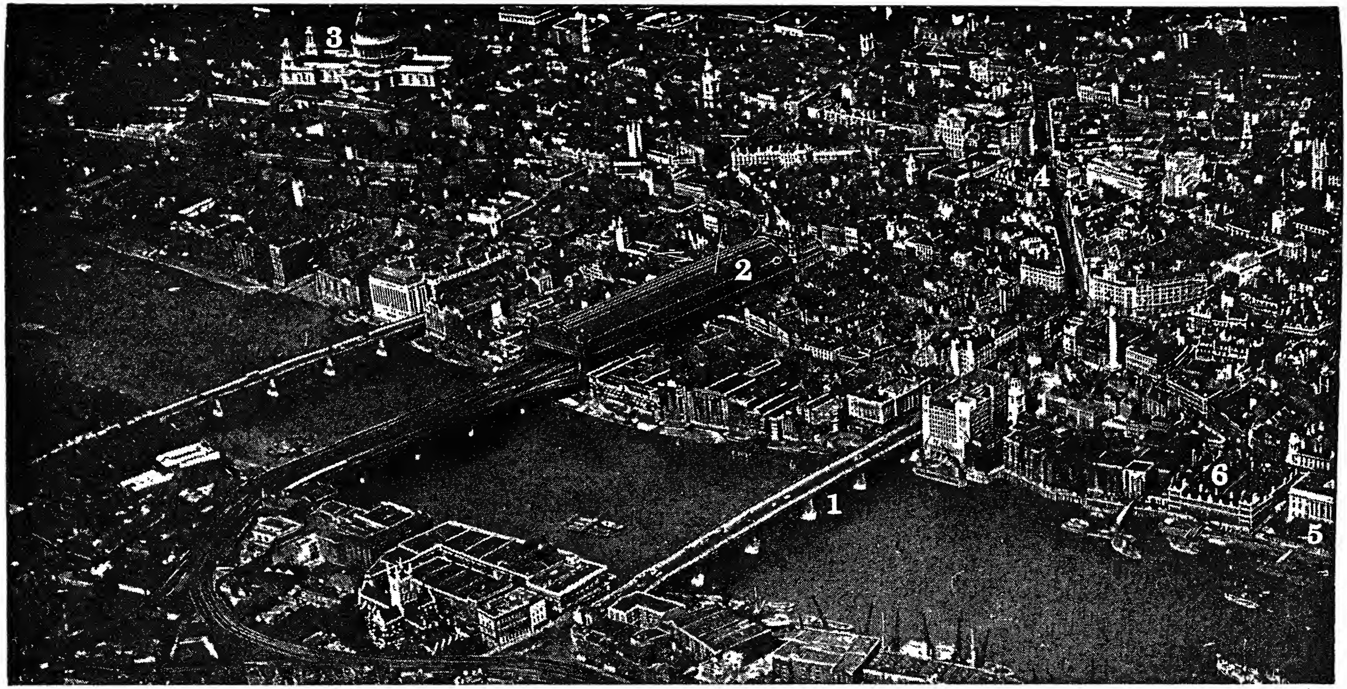


Fig. 243. Airplane view of London. The numbers show the location of the following places of interest: 1, London Bridge; 2, Cannon Street Station; 3, St. Paul's Cathedral; 4, Bank of England; 5, Custom House; 6. Billingsgate Market

those requiring speed, are transferred to railways at Southampton or one of the Bristol ports; and much of London's trade with the Continent moves through small ports on the southeast coast, where rail lines meet ferry routes to French or Dutch ports (Fig. 239).

Famous world entrepôt. London is a great collecting and distributing center for sea-borne commodities to be sold anywhere in the world, and this entrepôt trade links together the interests of many regions. For a long time British traders have been gathering products from remote regions and assembling them at London, where they may be sold either in Britain or abroad. For example, London importers who buy wool from Australia or rubber from Malaya sell to customers in the United States and on the Continent as well as in Britain. London handles more than half of Britain's re-export of imported commodities.

Commerce in tea illustrates London's interest both in the entrepôt business and in the Orient. Half the tea of international trade enters the port of London, and London ships most of the tea re-exported from Britain. London owes its rank as the world's leading tea market largely to its widespread trade connections and the big consumption of tea in Britain; but it also owes much to the reputation of certain British companies that have been in the tea business for several generations. These companies import tea from their own plantations in India and Ceylon and from newer plantation areas in British East Africa. They also buy special varieties from China, Japan, and Java. Logically, they order their imports sent to London, where they employ a veritable army of expert tasters and blenders to keep their brands uniform from year to year. Thus trading facilities and business reputation give added value to the site on the Thames.

Domestic trade of London. Like New York, London plays a major role in distributing many types of goods to domestic consumers. Being the principal railway center, it has direct rail connections with more of the British producing districts and consuming centers than has any other city. Trade in perishable foods illustrates London's importance as a wholesale center. During the night, truck loads and trainloads of fresh vegetables, milk, and other supplies move toward London from all directions; banana specials arrive from Southampton, Liverpool, or a Bristol port; horticultural products from Continental gardens arrive by ferry-rail routes; fish specials come from many British fishing ports to keep Billingsgate Market supplied.

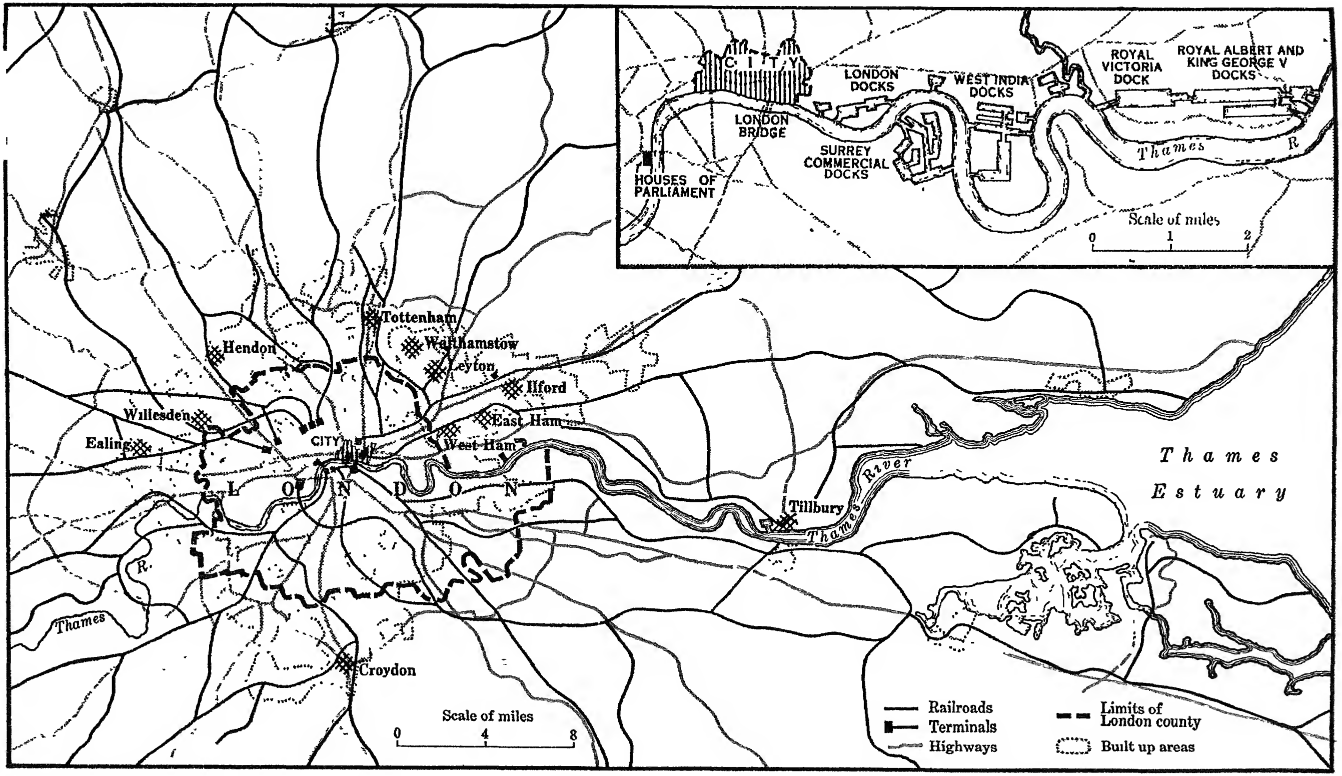


FIG. 244. Metropolitan London. The docks, located downstream from the City, are cut in the alluvial land along the Thames. Because the depth of water in the river varies greatly with changes in tide, the docks are closed basins with gates to keep the water at high-tide level

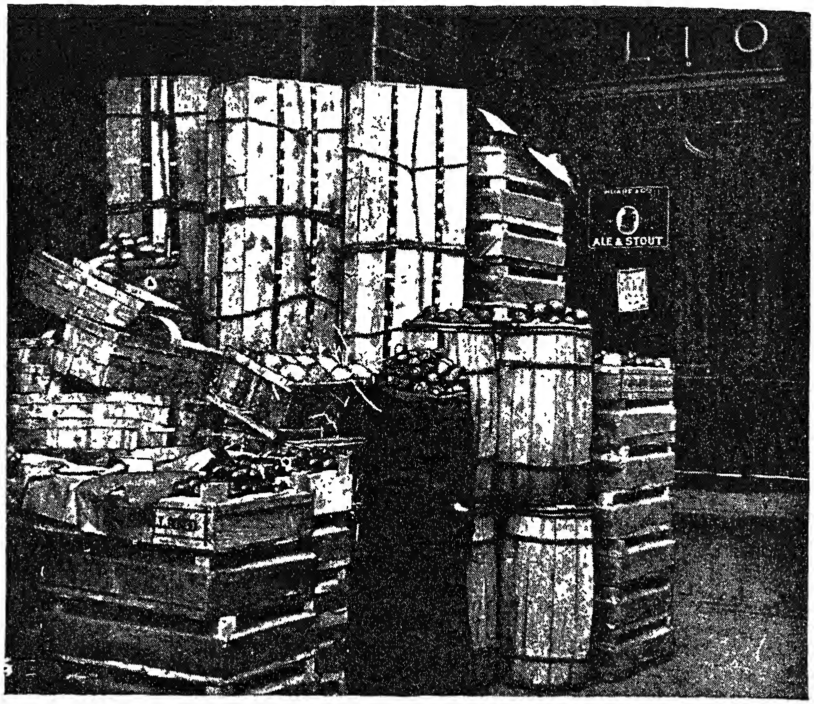


FIG. 245. A September fruit and vegetable display in Covent Garden, London. The large crates at the top of the pile were filled with onions from Valencia, Spain. In addition, this cosmopolitan display held English carrots, Belgian pears, Dutch tomatoes, French grapes, and German plums

Huge stocks from many sources are built up to supply the local market (Fig. 245). From these large stocks London wholesalers and commission men sell to merchants both in the London area and in lesser British cities. They even sell fresh fish to dealers in English fishing ports, and they ship such specialties as imported fruits and out-of-season vegetables to points as far away as Liverpool, Glasgow, and Belfast.

Manufacturing as a feature of the port of London. Like New York (pp. 383–388), London supports much manufacturing, which is attracted by the huge local demand, the facilities for wholesale distribution, and the traffic of the port. Manufacturing plants are distributed widely through the metropolitan area, but they are more numerous in the outer part of the built-up area than in central sections. In many cases they were established years ago on land outside

the city limits, and London has gradually surrounded them. In general, the industries that occupy sites on the Thames estuary differ in type from those near the western margin of the city, while those in the central part of London belong to still other types.

Manufacturing industries that use large quantities of bulky materials are characteristic of London's "East End." Having frontage on the navigable Thames, they can get imported raw materials and British coal without a rail haul. Their location also favors the delivery of finished products to London consumers or shipment by rail to other parts of Great Britain. Along the Thames water front are located, for example, the largest sugar refineries of England, paper mills that make about two thirds of the British newsprint supply, plants that refine petroleum from Iran and Iraq, fertilizer factories, mills that crush oilseeds, soap factories, and plants that supply the city with gas for fuel or light. Still other plants use local clays and chalk to make cement for the building industries of London or for export via the Thames waterway.

Heavy manufacturing is not at home in the western half of Metropolitan London, but many industries requiring a good deal of skill have been established on the northern outskirts of the built-up area. They manufacture mainly for the local market, with its eight or nine million people, making such products as electrical apparatus, automobiles and parts, clothing, furniture, and office supplies. Some of their output, however, goes to other parts of Britain and into the export trade. Using less material in proportion to the value of output than do the East End industries, they can utilize sites away from the water front.

A few manufacturing industries hold valuable sites in the central part of London. Of such are the handloom weaving of silk, the blending of tea, the preparation of cacao, and the blending and packaging of wines. These industries reflect London's long-standing trade in specialty products. On the other hand, the manufacture of high-grade clothing and jewelry and the printing of the big London dailies cling to their central locations because of interest in distributing their output to London people.

London as a banking center aids commerce. The great British banking center plays an important part in international trade. Buying and selling in foreign lands involve payment by check or bank draft, and nearly every important commercial city in the world con-

tains a branch of some London bank—an arrangement that provides the machinery for collecting and paying foreign accounts.

What happens when, for example, cotton goods are shipped from a Manchester exporter to an importer in Buenos Aires? As soon as the captain has signed the bill of lading, thereby certifying that the goods have been placed on shipboard, the exporter can receive payment from his bank in Manchester. The importer pays his account, when it is due, at the English bank in Buenos Aires. London adjusts the accounts of the two banks.

Commercial role of London the capital. The "West End" of London, containing the Houses of Parliament and the government offices, takes a deep interest in the success of British commerce. When new laws or treaties are proposed, the government always considers the probable effect on the nation's commerce. But it does more than make laws. The Colonial Office, for example, takes an interest in the prosperity and progress of people in British colonies all over the world. Scientists employed by the government seek ways of improving colonial industries. The introduction of cacao culture into the Gold Coast and the early experiments in cultivating the rubber tree illustrate this type of government work (pp. 93–94 and 602). New crops and new methods of crop production mean additional wealth for the colonies, and they also provide opportunities for increasing British commerce.

Britain's Part in World's Carrying Trade. Britain ranks first among maritime nations, with about a fourth of the world's ships. The British fleet contains more small ships than does the fleet of any other country. It also contains nearly half the very large vessels of the world, and it ranks first in the amount of cargo space provided with refrigeration. Britain's leadership in the carrying trade was formerly even greater than it is now, for in 1913 the British fleet made up almost 40 per cent of the world's ships. The change in relative importance results mainly from the fact that in the last two decades other countries have increased their fleets, particularly the United States, Japan, Norway, and the Netherlands. Since 1913 the cargo space on the world's ocean-going ships has nearly doubled, whereas during the same period there has been little change in the total amount of shipping under the British flag. However, British liner shipping has increased by more than 50 per cent, and the British tramp fleet has become smaller.

Aids to Shipping Industry. Modern commerce depends so largely upon the operation of ships that many agencies and services have grown up as aids to the shipping industry. Such agencies and services make it possible to carry on oversea trade in spite of long distances and the perils of the sea. Logically, many of these aids are of British origin.

Steamship fuel stations. British enterprise is largely responsible for the steamship fuel stations distributed along the shores of the continents and on islands convenient to the principal ocean lanes. At such stations dealers carry supplies of coal and fuel oil, selling on equal terms to all buyers, as do the filling stations along our highways.

Marine insurance. The dangers of the sea have led to the practice of insuring ocean shipments. The cost of insurance varies according to the lane where the ship will sail. A ship on the Mediterranean, for example, sails in relatively safe waters and can secure insurance at a low rate. About the tip of South America, in contrast, fierce storms are frequent, and ships sailing in that part of the sea must pay a high insurance rate. Vessels operating in the North Pacific pay an additional premium if they sail to ports north of 50 degrees north latitude, and they must agree not to enter Bering Sea between October 31 and June 8.

Ship registry. The practice of ship registry has grown up to protect passengers and shippers from unseaworthy ships. All ships sailing under the British flag are listed and ranked in the Registry of British Shipping and must be examined once in two years. A high ranking in the Registry of Shipping brings more favorable insurance rates than will be offered to less excellent vessels. Hence British companies make a practice of selling the ships that have become somewhat out of date and ordering new ones built at British shipyards. This custom not only keeps up the standards of service but also helps to explain why the output of British shipyards exceeds the combined output of all other shipyards in the world.

Britain Trades with Many Countries. British exporters and importers trade in all commercial regions, but they make more than 40 per cent of their sales and purchases in Continental Europe and the United States. Trade within the British Empire accounts for another 40 per cent. The rest is widely distributed. Trade with Europe is much greater than with the United States, but trade with the United States exceeds that with any other single country. Commerce

Groups of Imports		
Value in Million Pounds Sterling		
Textile fibers		104
Cotton	46	
Wool	45	
Others	13	
Meats and fish		88
Grains and products		74
Wheat	38	
Flour	4	
Corn	16	
Barley	5	
Others	11	
Dairy products and eggs		67
Lumber and wood pulp		54
Fruits and vegetables		50
Nonferrous metals and ores		46
Copper	13	
Tin	13	
Others	20	
Petroleum and products		37
Tea, coffee, cacao, and wine		36
Hides and skins, fur, and leather		31
Oilseeds and vegetable oils		20
Other imports		241
Total imports		848

Groups of Exports		
Value in Million Pounds Sterling		
Textile manufactures		124
Cottons	61	
Woolens	32	
Others	19	
Clothing	12	
Iron and steel products, including cutlery, tools, and hardware		42
Machinery		42
Coal and coke		32
Coal	29	
Coke	3	
Vehicles		32
Highway	22	
Railway	4	
Ocean	4	
Other	2	
Chemical products		21
Raw wool		21
Hides and skins, and manufactures of fur and leather		19
Manufactures of tin, copper, nickel, and other nonferrous metals		18
Other exports		150
Total exports		501

FIG. 246. Principal groups of British imports and exports in a recent year

with the Continent emphasizes the importance of nearness, for it consists chiefly of buying and selling in near-by countries of Western Europe. Within the Empire, trade is growing in importance through the influence of political ties. In the early 1930's, when commerce was suffering under a world-wide depression, Britain and the British Dominions made treaties in which they granted each other special tariff rates or other commercial privileges.

What Britain Buys and Sells. The commerce of the United Kingdom is characterized by variety. This fact is suggested by the number of important items in Figure 246, together with the large amounts left over for the items "Other imports" and "Other exports." The United Kingdom, in harmony with its extreme interest in manufacturing, imports foods and materials for factories and exports factory products. Four groups of food products (Fig. 246) account for nearly a third of the value of all imports. The importance of textile manufacture is suggested by the position of textile fibers and textile man-

ufactures on the import and export lists. Iron and steel products and machinery rank as major exports, but their combined value does not equal that of textile manufactures. Coal and coke, fourth among the export groups, would stand much higher in a table arranged on the basis of weight.

The textile trade. Textile manufacture is the most famous line of British manufacture, and cotton goods stand first on the list of textile exports (Fig. 246). Cotton goods are shipped to all parts of the Commercial World, but India buys more than any other country. In addition to cotton goods, British textile exports include manufactures of wool, linen, silk, and rayon. The greater part of the textile export leaves the country in the form of piece goods, but Britain also exports ready-to-wear clothing; and yarn from the spinning mills is exported to be woven in the mills of other countries.

Britain's textile trade has had discouraging experiences during the last two or three decades, particularly in the Orient, which formerly took more than half the British cotton-goods export. The situation in India illustrates what has happened. In 1913 British mills furnished more than half the cotton cloth worn in India (Fig. 247), though cotton mills had been established in Bombay before 1900 and skilled handworkers in India had made fine cotton cloth long before Columbus's day. The people of India wear as much cotton cloth now as they did a quarter-century ago, but they buy much less from Britain. Most of their supply is made in India. Similar changes have taken place in Eastern Asia, for many cotton mills have been established in both Japan and China.

The increasing competition met in the Orient by British exporters is typical of conditions throughout much of the Commercial World. Early British inventors designed power-driven machinery to spin and weave the cotton fiber, and for a long time the United Kingdom had no rival as a cotton-manufacturing nation. But the industry gradually developed in the United States, in Continental Europe, and elsewhere, producing for domestic use at first and then reaching out for foreign markets. Except while the cotton industry was very young, British manufacturers have aided its spread to other countries, for they have sold textile machinery abroad as well as at home. The result was expressed recently by an English engineer who traveled abroad to install textile machinery exported from England. He said, "We English taught the world to use machinery for manufacturing—and we

Cotton Goods	1913	1936
Total supply available for use in India . .	5,280,000,000 yds.	5,750,000,000 yds.
Sources of supply		
Made in India		
In cotton mills	20 per cent	60 per cent
On hand looms	20 per cent	26 per cent
Imported		
From Britain	58 per cent	6 per cent
From Japan		7 per cent

FIG. 247. Changes in the source of India's supply of cotton goods

taught too well, for our old customers are beating us at our own game." Between 1913 and 1936 British cotton-goods exports dropped from 7 billion yards to less than 2 billion yards.

The drop in sales of British-made cotton goods has affected many people besides cotton-exporters. It has resulted in idle spindles and looms in England; and the closing of mills has greatly reduced British imports of American cotton and the consumption of British coal. Because of hard times in textile towns and coal-mining communities, workers have less money to spend for Argentine beef or Canadian apples, and this in turn means less business for ships. Such changes are to be expected in the world of commerce, but they bring suffering to many people. British industries and the British government are trying to find a remedy for their trouble.

The coal trade. No other country exports as much coal as does the United Kingdom, and only Germany exports even half as much. In the number of ships needed to haul it, coal ranks first among British exports, and it ordinarily accounts for two thirds of the weight of British exports.

In general the British coal trade operates over short distances. About 40 per cent of the export volume goes to ports on the route into Europe via the Narrow Seas and the Baltic, and about half as much to Mediterranean ports of Europe and Africa. East-coast ports of northern England and southern Scotland logically handle the greater part of the Baltic trade, shipping from near-by fields (Figs. 241 and 248). Both east-coast and west-coast ports ship to the Mediterranean, but Bristol Channel ports have the largest share of this trade. Of the coal exported to more distant areas, the greater part goes to the Americas, Argentina being the best American customer.

Some British coal is imported into foreign countries for use as fac-

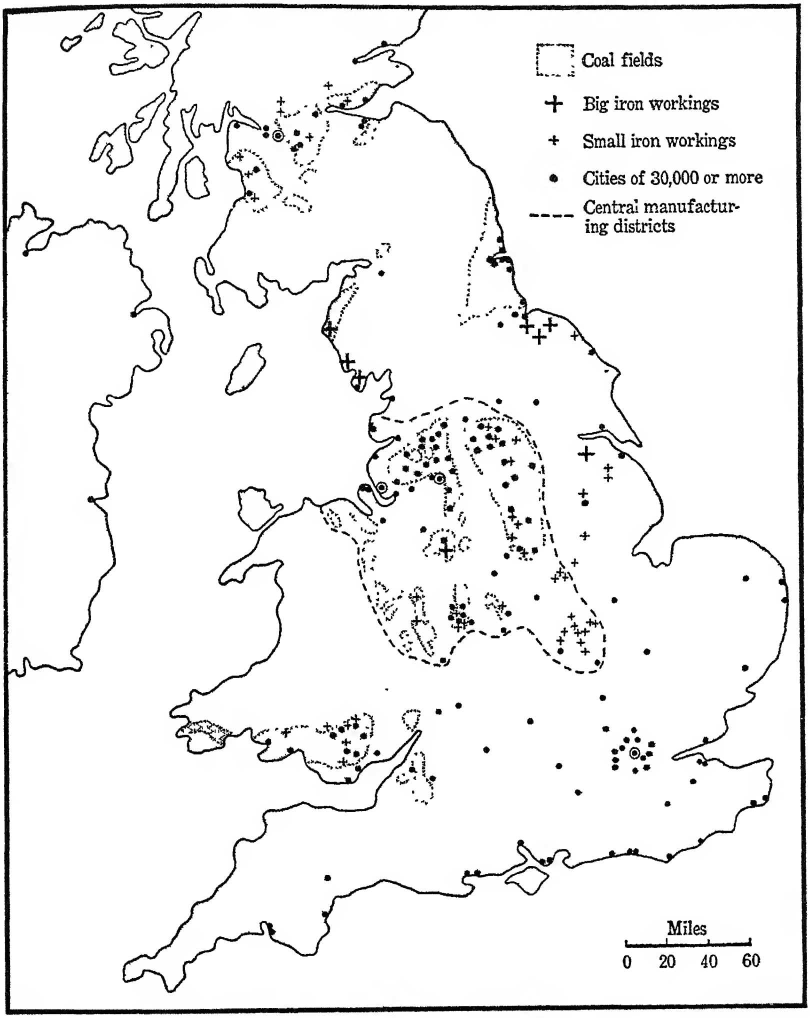


Fig. 248. Principal cities, coal fields, and iron workings of Britain

tory or railway fuel, but much greater quantities are used for ocean transportation. About a quarter of the export volume leaves British ports in the bunkers of ships that take on fuel there for their own use; and British authorities estimate that half the export coal is destined for fuel stations on ocean highways. Thus the rise of petroleum as a fuel for ocean vessels has been a severe blow to the British coal trade.

Fig. 249. Moorland on the summit of the Pennines, near the highway that connects Manchester and Leeds. Though these bleak and wind-swept uplands are not suited to cereal crops, they furnish grazing in summer

Commercial Leadership Related to Resources of Land. When one sees the great volume of commerce pouring through British ports, and when he realizes the world-wide scope of that commerce, he wonders what forces keep the trade in motion. This question leads to a consideration of British manufacture. Back of the busy ports lies Industrial Britain, where men are giving the labor of their hands and of their brains to produce goods for the world's markets. Underlying the labor of the British people is the land itself, with its valuable position and its rich resources.

2. *Industrial Britain*

Principal Manufacturing Districts. Industrial Britain, the national workshop, lies well back from the London gateway and is separated from the metropolis by a belt of farming and sheep-raising country. It consists of five districts, each separated from the others by stretches of agricultural country, or in some cases by barren uplands (Fig. 249). The South Wales District fronts on Bristol Channel, about 150 miles west of London (Fig. 250). The Central Districts occupy nearly the full width of England between Liverpool and Hull. The Newcastle, Scottish Lowland, and Belfast districts all occupy coastal positions.

The Central Districts. Central England contains a group of manufacturing districts spread over the coal fields which underlie the hill country on the flanks of the Pennines (Figs. 250 and 248). These districts are largely responsible for the reputation of British goods abroad. They produce a large part of the textiles and machinery which go to foreign countries. Furthermore, manufacturing by machinery started in that part of England, and in early days the Central Districts supplied most of the export goods.

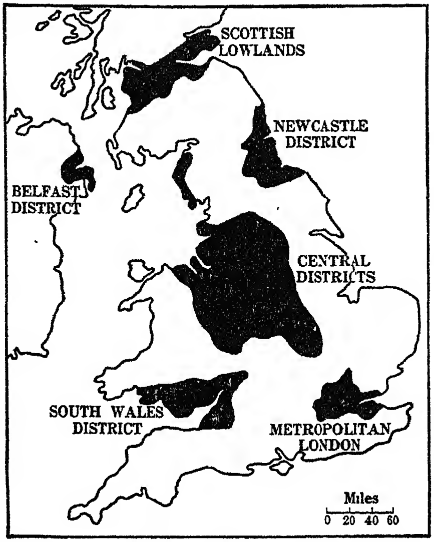


FIG. 250. Principal manufacturing districts of Britain

The output of the Central Districts is extremely varied. The Manchester District is famous throughout the Commercial World for its cotton goods (pp. 279–280). Spinning towns are grouped about Manchester, on tributaries of the Mersey, while the weaving towns are in the Ribble Valley, near the northern margin of the district (Figs. 251 and 162). The district also manufactures cotton-mill machinery, chemicals, and automobiles and smelts tin ore from Bolivia. Leeds and the other Yorkshire towns on the opposite slope of the narrow Pennine divide make woolen goods of high quality. They also manufacture woolen-mill machinery and ready-made clothing.

Sheffield's history as a steel-manufacturing center goes back to the days of hand industries, when its famous craftsmen made swords for the Crusaders. It now has big steel mills which manufacture high-grade special steels, but it also has hundreds of little forge rooms, where skilled workmen make fine cutlery by hand. The southern districts of this central group have an exceedingly diversified output. Birmingham is the leading English center for the manufacture of automobiles and bicycles, while some of the towns clustered about it specialize in hardware and others in leather goods; Nottingham and Leicester are noted for their fine laces and knit goods; and some

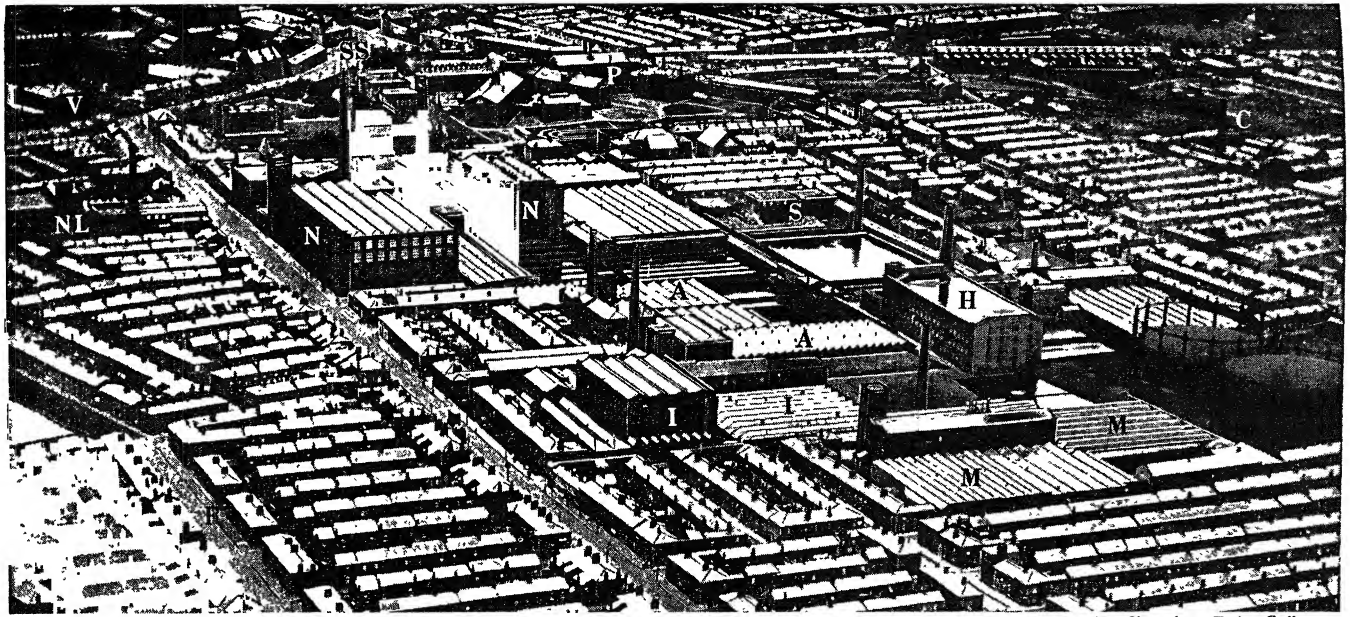
of the well-known makes of English chinaware and pottery come from Stoke, which is known far and wide as the Potteries.

The Central Districts occupy favorable sites for manufacturing. They have local supplies of coal, many of the mines being inside the limits of the manufacturing towns (Fig. 248). At the same time, their seaboard position facilitates the import of raw materials and the shipment of finished products. The port of Liverpool is only a few miles from the mills of the Manchester District, and the neighboring Yorkshire Woolen District extends to within 50 miles of Hull (Fig. 162). Birmingham, farther inland than the other important centers, is within 100 miles of both London on the southeast and Cardiff on the southwest. The wool import illustrates the choice of ports open to the business of these districts. Yorkshire factories get Australian wool through London, Argentine wool through Liverpool, and wool from the Continent through Hull.

Scottish Lowlands and the Clyde shipyards. A belt of lowland dotted with manufacturing communities stretches across Scotland from the Clyde estuary on the west to Dundee on the east (Figs. 250 and 241). The major interest of the Scottish Lowland District is revealed by a trip up the Clyde to Glasgow. For 20 miles the estuary is bordered by shipyards and appears as a forest of masts, spars, and scaffolding. This world-famous district builds all manner of craft, from a fishing schooner to a big passenger liner or a battleship.

The Clyde shipyards form a market for many industries in Glasgow and neighboring cities and towns, for they must buy structural steel, engines, pumps, steering gear, guns, sailcloth, rope—in fact, everything needed to build and equip any kind of ship. These industries, in turn, draw their materials from local blast furnaces and steel mills, while the blast furnaces secure their coal and part of their iron ore from local mines (Fig. 248). Shipyards, iron-working industries, and mines employ many men, and the district has textile mills in which most of the laborers are women. These mills work in cotton, wool, and silk, but their most famous product is sewing thread.

Belfast and Irish linen. Belfast, the home of Irish linen, resembles Glasgow in that it engages in both shipbuilding and textile manufacture. It differs from other British manufacturing districts in not having a local coal supply. Part of the coal, iron, and steel used in the Belfast shipyards comes from the Scottish Lowlands and part from the west coast of England (Figs. 250 and 248). In some respects



Aerofilms, from Ewing Galloway

FIG. 251. Looking west over Preston, a cotton-weaving town in the Ribble Valley (Fig. 162). Preston measures about three miles from east to west, and it is only a half mile from the Manchester Mills in the foreground to the point where Stanley Street meets the upper margin of the picture. Letters show the location of the following: SS, Stanley Street; V, Sovereign Mill (cotton); NL, New Hall Lane Mill (cotton); F, Fishwick Parade; P, Prison; N, New Preston Mills (cotton); A, Alliance Mills (cotton); I, India Mills (cotton); H, Hartford Mills (cotton); S, Sawmill; C, Candy factory; M, Manchester Mills (cotton)

Belfast may be considered a detached portion of the Scottish Lowland District, but it differs from Glasgow in that its fame rests on its textile output rather than on its ships.

"Irish linen" is a trade-mark which merchants show with pride, and the largest market for this high-grade fabric is in the United States. The Belfast district has skill and reputation based on long experience in linen manufacture. It also has a mild and humid winter which permits outdoor bleaching to continue throughout the year. This is a great advantage, because the bleaching of linen is a long and difficult process. The Irish climate and the Irish bleachers have such a well-established reputation that a considerable quantity of French, Belgian, and German linen annually is sent to Belfast to be bleached and then returned.

South Wales District. The South Wales District works with zinc, copper, and nickel; manufactures iron and steel; and is particularly famous for its manufacture of tinplate and galvanized sheet steel. The raw materials are gathered from many regions—iron ore from Spain and Algeria, tin from Bolivia and Malaya, zinc ore from Australia, copper from Chile and the United States, and nickel from Canada, for example. The factories are located on the shore of Bristol Channel, and the coal comes from mines only a few miles away.

The seaboard position of the South Wales factories is favorable both for securing imported raw materials and for shipping the finished products to British customers or to foreign markets. Shipping services are numerous; for many ships, after delivering cargo at London, Liverpool, or some Continental port, visit Cardiff to fill their bunkers, or to load coal or metal products for foreign ports.

Newcastle and structural steel. The Newcastle District, long famous for its coal shipments to London and across the North Sea to Continental ports, now builds ships and manufactures iron and structural steel for export. Iron ore, limestone, and coal are assembled at Middlesbrough from sources within 25 miles of the blast furnaces. In addition, imported ore is obtained cheaply, since the blast furnaces are on the water front. Big liners bound for the Orient, Australia, Africa, and South America tie up at the docks adjacent to the steel mills and load iron and steel products for those remote areas.

Manufacture Based on Natural Advantages. To a large extent, British manufacturing industries find their principal markets and the principal source of their raw materials outside the British Isles.

The Manchester cotton industry, for example, gets its raw fiber from the United States, Egypt, India, and the cotton-growing countries of South America, and finds its chief market in India. Similarly, Belfast linen-manufacturers buy flax fiber from Eastern Europe and sell fine linen in the United States. Nevertheless, the success, as well as the origin, of British manufacture and trade rests definitely upon the advantages and resources which nature bestowed on Britain.

Position at front door of Europe. One of the principal advantages of Britain is its position at the front door of Europe and on the great ocean highway which connects Western Europe with North America (Figs. 28, 200, and 235). All oversea commerce en route to the Baltic, the Rhine, the Elbe, or the Seine must pass its shores. Just as the water front in New York is a desirable site for factories using imported raw materials, so Britain is a logical place to manufacture goods going into or coming out of Western Europe. It is a convenient stopping place on the route which the goods must travel. It is a logical place also to manufacture imported commodities, such as wool or cotton, for wide distribution.

Coal near the sea. To the advantage of position, nature added generous supplies of coal placed conveniently near the sea (Fig. 248). Manufacturers in Manchester, Glasgow, and other important centers pay little or no railway-freight charge on their coal, and at the same time they are within truck haul or a short rail haul of the port through which they import raw materials and ship their output.

Local supply of iron ore. For the success of British industries and commerce, great importance attaches to the nation's iron-ore resources. Britain's iron and steel industry has a twofold bearing on the country's commercial leadership. Steel products constitute a major line of export; and steel, because of its use in constructing machinery, is essential to all lines of manufacture. Iron ore is widely distributed in Industrial Britain (Fig. 248). Nearly all the major manufacturing districts have iron-ore deposits, as well as coal and limestone. In some instances coal and iron ore come from the same mine, and limestone from a near-by quarry. In early times local mines yielded all the ore used in making British steel products. At present, manufacturers who operate big blast furnaces on the seaboard find it profitable to import high-grade ores from Spain, Sweden, and other countries, but British mines still supply about half the iron ore consumed in the country.

Skill gained through experience. The success of present industries in Britain is built upon the experience of the past. The quality and variety of the export goods indicate that the people who turn out these goods have a high degree of skill. This skill has grown out of long experience in manufacturing. British experience in manufacturing goes back to very early times and covers all the steps from primitive handiwork using few resources to the intricate processes of modern manufacture, using many resources.

Long before the age of machinery, agricultural communities occupied the districts which now engage in manufacture. They won their living chiefly from the soil, but made textile fabrics and steel products by hand. Pasturing their sheep on the grassy hillsides, they secured wool for their looms, while the forests yielded wood for construction and charcoal for smelting the local iron ore. Using ships built in their own harbors, the English traded with Continental countries and explored new coasts.

The growing trade across the Atlantic and with the Continent led to a search for better methods of manufacture. When water wheels were devised, swift streams among the hills served the needs of people already skilled in manufacturing. The same hills gave coal for fuel when the steam engine had been perfected, and iron ore to provide the larger quantities of steel required. After each new step in the development of manufacture, people set about solving new problems, thus gaining new knowledge and new skill. In each stage the rich resources of the land provided the materials and opportunities necessary for the next advance. By utilizing the productive soil, forests, streams, mineral wealth, and position which nature bestowed upon Britain, the British people have gained a high place in the Commercial World.

QUESTIONS

1. Why is commerce important to the people of the United Kingdom? How is British commerce important to people in other countries?

2. Which of these rivers—Seine, Mississippi, Amazon, Paraná, Congo—reach the sea through broad estuaries, as does the Thames (Plates I, IV, VI, and VIII)?

3. What are the principal gateways through which commerce enters and leaves Britain? Which ranks first?

4. What port is also the leading railway center of the country? What relation is there between its importance as a railway center and its wholesale trade? What bearing may its wholesale trade have on its rank in the import trade?

5. How in general do British exports differ from British imports?

6. What relation is there between exports and manufacturing districts? between imports and manufacturing districts?

7. What export group ranks first in value? What import group?

8. Which has the higher total value among British imports, textile fibers or foods? Name four of the major groups of food imports.

9. Give facts to illustrate the statement that London is a great entrepôt port. Cristobal, in the Panama Canal Zone, also is an entrepôt port. What bearing has this fact on the amount of warehouse space needed at Cristobal?

10. From what areas does the United Kingdom import wheat in autumn (p. 230)? in January and February? in June and July?

11. From what countries does the United Kingdom probably import much raw cotton? coffee? lard? tobacco? lumber? nickel? copper? petroleum?

12. How do British banks aid commerce? Give an illustration.

13. What British manufacturing districts are located on coal fields (Figs. 250 and 248)? What bearing has this location on the cost of manufacture?

14. What may the following have to do with trade? a tariff? a treaty? a bill of lading? a bank draft?

15. In what two ways does Irish linen help to swell British trade?

16. In which division of textile manufacture are spindles used—making yarn, weaving, finishing trades, or clothing manufacture?

EXERCISES

1. *Empires tied politically to Western Europe*

THE BRITISH EMPIRE

Prepare a map with the title given above. Leave space below "The British Empire" for four other names. Keep your map for further use. You will add to it when you work on Chapters XXXI, XXXIII, and XXXIV.

a. On an outline map of the world show the United Kingdom in red. Then indicate all countries of the British Empire also in red. Refer to page 682 and to Plates I, IV, V, VII, VIII, and IX to find countries belonging to the British Empire.

b. After the name "The British Empire," draw a small rectangle and color the rectangle red as a legend to explain your map.

c. Study your map and be prepared to talk on the following points: (1) size of the empire as compared with the United Kingdom itself; (2) continents in which the empire is represented; (3) largest of the empire countries; (4) empire country with largest population; (5) empire countries that probably grow tropical crops; (6) empire countries that have summer when the United Kingdom is having winter.

2. *Finding your way about London*

Study Figures 243 and 244 to get your bearings in the world's largest city. If you travel from Dover to London by rail, your train may land you at the Cannon Street Station (2 in the picture). Test your orientation by means of the questions below.

a. What river does your train cross to reach the station? In what direction is it moving? Is London Bridge upstream or downstream from the railway crossing?

b. In what part of Metropolitan London is the Cannon Street Station, near the eastern edge, near the center, or near the western edge (Fig. 244)?

c. If you wanted to visit the West India Docks (Inset, Fig. 244), would you turn to the right or the left after crossing the bridge into the City?

d. Why does London have closed docks instead of piers like those of New York?

e. Which way would you turn to go from London Bridge to the Houses of Parliament?

f. Why is the Custom House (5) located near the river? Why does it need to be east of London Bridge instead of on the other side?

g. Seven streets meet at a point (4) nearly a half mile north of London Bridge. What important buildings are located there?

3. *The ports of London and New York—a comparison*

Prepare an outline for a talk on London and New York, the leading ports of the world. Consult Figs. 198, 202, 204, 205, 208, 244, and 245, and Plates I, III, V, and VI. Be prepared to show how the two ports are alike and how they differ. Include the following points:

a. comparative amount of water-front space for building docks and piers
b. location of docks or piers with reference to river
c. use of closed docks or open piers
d. presence or absence of suburbs about the main city
e. location of railway terminals with reference to water front
f. manufacturing and its relation to port business
g. importance of bridges within built-up area
h. ocean routes over which trade probably moves
i. importance as railway center
j. political importance

CHAPTER XXXI

THE CONTINENTAL SEABOARD

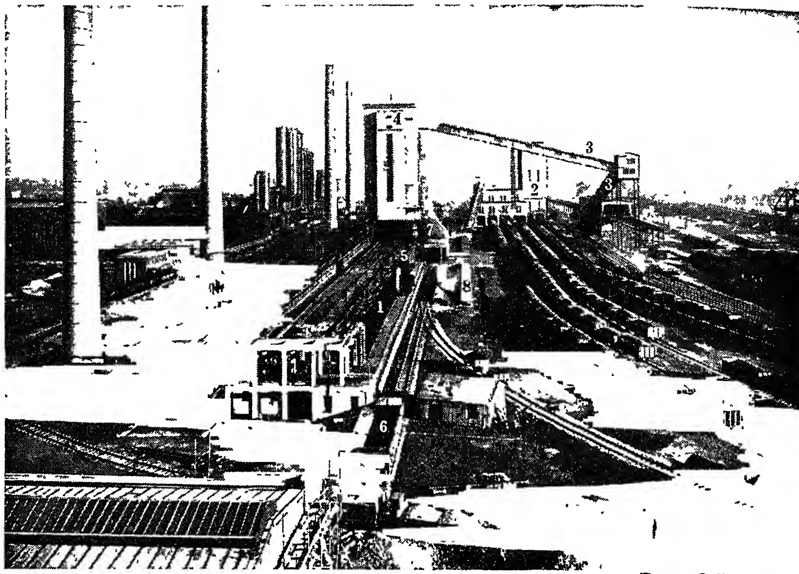
Focus of Transportation. Like the Eastern Seaboard of the United States, the strip of land from Le Havre to Hamburg is the gateway into a continent. Ocean highways focus on four great ports (Figs. 235 and 239) and a host of lesser portals. Railroads, highways, and canals lead from the ports into the Continent. One broad route extends eastward, following the plain between the Baltic Sea and the hill country (Fig. 230). The Rhine Valley, with both rail and water transportation, furnishes a route to Switzerland and connects with routes to the Danube plains. Other routes lead southward via Paris to the Mediterranean countries. The meeting of land and sea traffic gives business to many commercial cities and leads to a large amount of manufacturing; and the seaboard area is, commercially and industrially, the most highly developed section of Continental Europe.

Rank in Manufacture. The Continental Seaboard is responsible for a large and diversified output of manufactured goods. It is a large producer of iron and steel (Fig. 252), and its factories turn out steel products ranging from needles to mining machinery and ocean steamships. It has large textile industries, and some of Europe's principal chemical plants are in operation there.

The seaboard area contains the largest textile-manufacturing industries on the Continent, working in cotton, wool, linen, silk, hemp, and jute. Since most of the textile fibers come from overseas, the seaboard area offers decided advantages for this line of manufacture. Germany's largest textile centers are on or near the lower Rhine (Fig. 155); textile towns of large output cluster near the coast in Northern France; and Belgium has a long history as a textile-manufacturing country, its well-established reputation being suggested in the commercial term "Brussels carpet."

The International Triangle. The trade and manufacture of the seaboard area are most intensely developed in the section centering about the lower Rhine. Two great ports, Rotterdam and Antwerp, serve the busy Rhine area. Like New York and London, these ports have big manufacturing industries associated with their trade.

Surrounding the ports and stretching many miles inland is the flat delta plain, with its numerous waterways, marshes, pastures, and gardens. On the southeast the surface rises gradually and breaks into



Ewing Galloway, N.Y.

Fig. 252. By-product coking plant of an Essen steel company. The coke ovens (1) are just to the left of the center. Railway cars bring coal from near-by mines, for the plant is located on the Ruhr coal field. They dump their loads on conveyors beneath the floor of the tower (2), which contains machinery to run the belts in the covered conveyors (3). The storage tower (4) holds the coal until it is needed to charge the coke ovens. A mechanical device (5) that runs on a track transfers coke from the ovens to cars like the one in the foreground (6). In the quenching tower (7) the coke is flooded with water; notice the steam coming from the tower. Notice also that steam is coming from the chute (8), where a car of coke has just been dumped. At the left an elaborate plant for treating by-products is seen beyond the tall chimneys

hill country (Fig. 230) with busy manufacturing towns distributed along the valleys. The Rhine, with its deep-water channel across the delta and its gorge-like valley cut through the hill country, forms the principal artery of trade. Manufacturing communities spread over a broad area extending from Calais on the Narrow Seas to the Ruhr District of Germany and the Lorraine District of France (Fig. 253). This is the International Triangle, a highly prized commercial and manufacturing area shared by Germany, France, Belgium, Luxembourg, and the Netherlands.

The industries of Continental Europe reach their climax in the International Triangle. Cities cluster there more thickly than else-

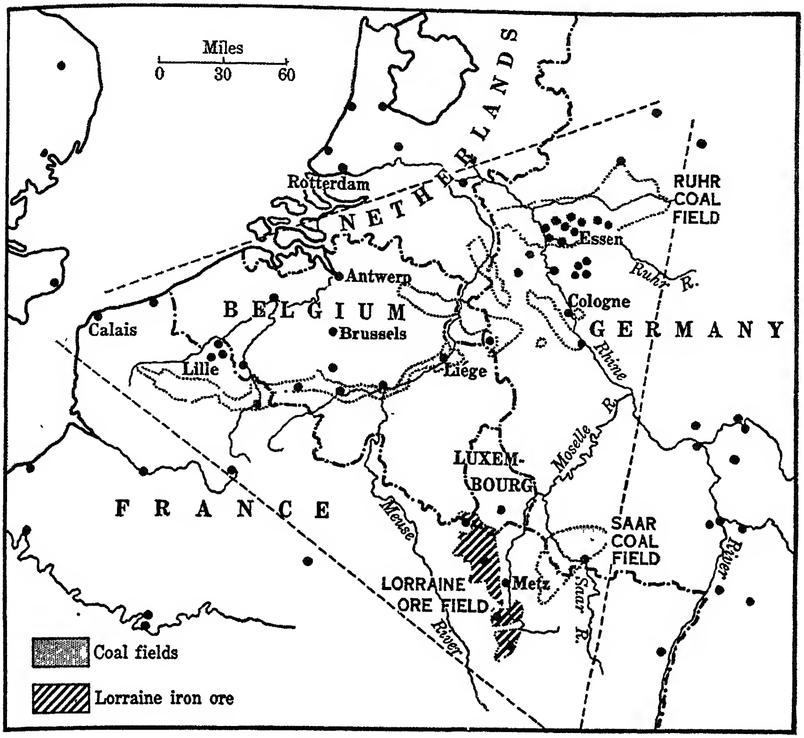


Fig. 253. The International Triangle. This highly developed manufacturing area is noted particularly for its iron and steel, textile, and chemical industries. In general, blast furnaces and steel mills are restricted to cities and towns on the coal and iron-ore fields, like Essen and Liége. Textile mills and chemical plants have a wider distribution, and so has the manufacture of iron and steel products from pig iron and steel ingots. South of Essen, for example, is a group of four manufacturing towns off the Ruhr coal field. Elberfeld and Barmen, the northern pair in this group, are textile centers with important dye works. Solingen and Remscheid, the other two, are steel-using centers, making hardware and cutlery

where on the Continent. Farms are intensively tilled, and mines yield a large output. Rivers, canals, railroads, and highways carry heavy traffic to and from the manufacturing cities, and millions of tons of freight annually pass through the near-by ports.

The International Triangle ranks high in many industries, but it attracts attention chiefly through its manufacture of iron and steel. This line of manufacture supplies the basic material for many industries in the European Manufacturing Belt.

Iron and Steel in the International Triangle. The International Triangle is the most important iron and steel manufacturing area on the Continent (Fig. 254). It produces a large proportion of the pig-iron and steel output of both Germany and France, and the total output of Belgium and Luxembourg. These four countries together produce about a fourth of the world's steel.

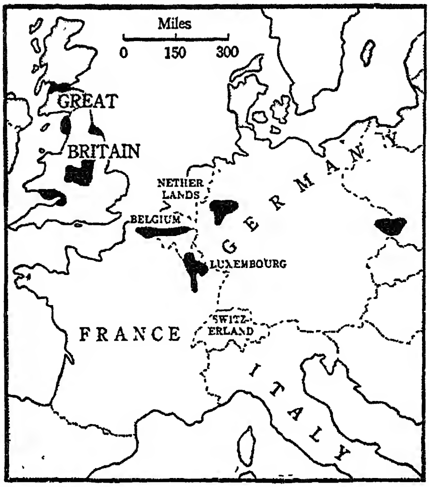


Fig. 254. Principal steel districts of Western Europe

Blast furnaces and steel mills are distributed in three sections of the International Triangle. The largest output comes from the Ruhr District, with Essen as a famous steel center. A dozen cities and towns are spread so thickly over the Ruhr coal field that the Germans have given the name "Ruhrstadt" (Ruhr City) to the group (Fig. 253). The second group of steel centers includes a succession of cities and towns built upon the narrow strip of coal-producing land which extends from the Ruhr District across Belgium into Northern France. Liége is the best-known of the Belgian steel centers. Near Metz, at the southeastern apex of the triangle, pig iron and steel are manufactured in the iron-mining district of Lorraine and on the Saar coal field. The Lorraine District lies chiefly in France, but it extends also into Belgium and Luxembourg.

Convenient location of resources. Steel manufacture in the International Triangle takes place under favorable natural conditions, for iron ore and coal occur close together and near the sea. In the Ruhr District, coal underlies the steel-manufacturing cities, and iron ore is received both by rail and by Rhine barges from Lorraine, about 150 miles away. Manufacturers make large use of cheap water transportation on the Rhine for exporting finished products through Rotterdam and for importing Spanish and Swedish ores.

The Lorraine and Saar blast furnaces are farther from the sea than are those of the Ruhr, but Lorraine ore and Saar coal are only

about 30 miles apart. The Belgian steel centers have advantages similar to those of "Ruhrstadt." They are coal-mining centers, they are less than 100 miles from the Lorraine iron mines, and they have canal connections with Antwerp.

Utilization of Ruhr coal. The great iron and steel plants of the Ruhr District are located in the richest coal-producing area of the International Triangle. The Ruhr field contains the largest deposit of high-grade coking coal in Europe. Ruhr coal makes excellent coke (Fig. 252), and besides supplying the local blast furnaces Ruhr coke goes to other iron-manufacturing centers of the International Triangle.

Cheapness, as well as quality, has favored the wide use of Ruhr coke. Mining costs are relatively low, since the coal seams lie at moderate depths and are thick enough for the use of mining machinery. The by-product process was used extensively in the Ruhr District earlier than elsewhere, the near-by cities and chemical plants furnishing a market for the by-products. Profits from the sale of by-products made it possible in this early period to undersell coke manufacturers in other districts where the old beehive ovens were in use.

Utilization of Lorraine ores. Lorraine mines furnish the principal ore supply for blast furnaces throughout the International Triangle, though ores from other regions also are used. The Lorraine ores are of rather low grade, but they are abundant, making up more than 40 per cent of Europe's iron-ore resources; and they can be mined more cheaply than most European ores.

Because the Lorraine ores contain a considerable quantity of phosphorus, they could not be used profitably until the "basic open-hearth process" made it possible to remove this element cheaply. The phosphorus comes off in the slag, and this slag is a phosphate suitable for fertilizer manufacture. It is therefore a salable by-product. Once the phosphorus difficulty had been overcome, the manufacture of iron and steel in the International Triangle increased rapidly.

The market situation. Iron and steel manufacture in the International Triangle is well placed with reference to markets. In the first place, the International Triangle itself constitutes a big local market for pig iron and crude steel, since it contains a host of industries which manufacture steel products. In the second place, the International Triangle occupies a central position in the European Manufacturing Belt. The arrangement of railways (Fig. 239) and inland water

routes makes the International Triangle a logical source from which to supply inland manufacturers with pig iron and crude steel, while its position near the coast favors shipment to England. In the third place, a seaboard position, together with advantages for assembling raw materials, permits manufacturers in this area to take a large part in oversea trade.

To their natural advantages for marketing, manufacturers in the seaboard area, particularly those of the Ruhr, have added efficient methods of production. For example, through the sale of by-products, such as phosphate slag and the by-products of the coking process, they have cut down the cost of steel manufacture. As a result, they offer keen competition to British and American companies.

International Problems. A great iron and steel industry has been built up in the International Triangle by utilizing natural resources and by means of co-operation between people in different countries. Political lines are so placed that no one of the nations is independent in the manufacture of iron and steel. For example, Germany has the rich Ruhr coal field but not enough iron ore, while France has the Lorraine ores but lacks an abundant supply of cheaply mined coal. Moreover, the Lorraine manufacturers ordinarily sell a considerable portion of their output in Germany. Consequently, the iron and steel industry calls for much traffic back and forth across international boundaries.

At times international disputes have interfered seriously with industries in the International Triangle. This area long has been of great commercial and industrial importance, and there have been many disputes among European nations over the valuable territory.

As a result of the Franco-Prussian War, for example, Lorraine was lost to France, but after the World War it was restored. Transfer of ownership led to regulations which interfered with the movement of goods across the newly established political boundaries. The industries of the International Triangle suffered, and for several years they waited for the governments to reach an agreement. Finally, the principal steel companies of Germany, France, Belgium, and Luxembourg, together with companies operating in several other Continental countries, formed an international syndicate. The agreements of the syndicate did away with many of the difficulties, and the International Triangle again became an active competitor of the United States and Britain in foreign trade.

When the stronger European nations entered into a new war in 1939, borders were closed in the International Triangle, crippling industries and trade. The various districts work together in times of peace, and each benefits from the co-operation; but they are fought over during wartime and suffer accordingly. The International Triangle is geographically a unit, and when wars or trade restrictions sever it they bring hard times to all concerned.

QUESTIONS

1. What Continental countries have frontage on the strip of coast extending from Le Havre to Hamburg (Plate V)?

2. What important river routes lead inland from this strip of coast (Plate VI)? To what countries do they lead?

3. With what ocean lanes do the river routes make connection (Fig. 28)?

4. The principal German petroleum refineries are located near Hamburg. Show that this is a logical location for them. From what sources do they probably get crude oil (p. 337)?

5. There are important petroleum refineries near Le Havre and Rouen. Are they market or field refineries (pp. 341–346)?

6. Why do ports of the Continental Seaboard import large quantities of cotton (Fig. 155)? To what countries do the cotton imports probably go? From what countries do they probably come?

7. Which is better located for exporting coal by sea, the Ruhr field or the South Wales field (Figs. 253 and 248)?

8. What countries have coal resources in the belt extending southwest from the Ruhr District?

9. What products probably are sold from the plant shown in Figure 252? How does the operation of such a plant affect the cost of making steel?

10. What countries have mines in the Lorraine ore field?

11. Where in the International Triangle are iron and steel manufactured? What advantages has each of these locations?

12. Why is Liége a better place for blast furnaces than Brussels?

13. Paris manufactures iron and steel products but does not contain blast furnaces and steel mills. Where do manufacturers probably get pig iron and crude steel?

14. What advantages has the Continental Seaboard for horticulture? for dairy farming?

15. Why are there many ferry ports on the Continental shore of the Narrow Seas?

EXERCISES

1. *Two seaboard areas—a comparison*

Write two paragraphs comparing the Continental Seaboard of Western Europe with the Eastern Seaboard of the United States (pp. 357–367). In the first paragraph tell how the two areas are alike, and in the second paragraph tell how they differ. Consider (1) interest in trade by sea, (2) number of major ports, (3) relation to railway routes into a continent, (4) relation to inland waterways, (5) mineral resources, (6) importance in manufacturing, and (7) relation to political divisions, either countries or states. (Consult Plates II, III, V, and VI.)

2. *Coke and steel in the International Triangle*

Study Figure 252 and be prepared to discuss the relation of coke manufacture to iron and steel in the International Triangle. Consider the following points: (1) kind of plant shown in Figure 252, (2) location of plant with reference to coal supply and steel-manufacturing district, (3) main business of the company that operates it, (4) parts of factory shown in the view, and work of each part, (5) principal product and by-products coming from the factory, (6) effect of the work of the plant on the price at which the company can sell steel, and (7) probable location of other plants of similar type in the International Triangle.

3. *Empires tied politically to Western Europe*

THE BELGIAN EMPIRE; THE EMPIRE OF THE NETHERLANDS

Add these titles to the map which you started in Exercise 1, Chapter XXX. Then show Belgium and the Belgian Congo in blue. Use green for the Netherlands and its colonies. Study your map as you studied that of the British Empire, making comparisons (1) with the mother countries and (2) with other empires. Explain your colors in a legend, as before. (Consult page 682 and Plates IV, VII, and VIII.)

CHAPTER XXXII

GERMAN CHEMICAL MANUFACTURE

Germany a Commercial Nation

By means of the topics and references below, make a general survey of German trade and resources to provide a background for the study of Germany's most distinctive industry.

Commercial importance. How many countries of Western Europe surpass Germany in value of foreign trade (Fig. 229)?

Variety of resources. Can Germany's resources support many or few industries? Decide after answering these questions.

1. How many European countries are larger than Germany?
2. Of the four belts between the Baltic and the Mediterranean—plain, hill country, mountains, and Mediterranean border—which lie partly in Germany?
3. What bearing on its power resources has Germany's location with reference to these belts? on its ore resources? on its resources of farm land?
4. Do the Germans probably produce a larger or smaller proportion of their own food than the British? (With nearly twice as many people as Britain, Germany has five times as much arable land.)

Nature of export trade. Do German exports probably consist mainly of manufactured products or of foods and raw materials? Before deciding on your answer, consider the following points:

1. Size of German share of the Manufacturing Belt, as compared with that of other Continental countries, and German districts in the belt (Figs. 235, 253, 254, 257, and 155);
2. Germany's rank in steel manufacture (Exercise 2, Chap. XXIX);
3. Workers employed in German factories (about a third of all people gainfully employed, as compared with 40 per cent in England and Wales and 29 per cent in the United States).

Opportunity for European trade. In a recent three-year period, German exports were valued at five sixths as much as those of the United Kingdom, but Germany exported nearly twice as much to European countries as did Britain. Study Plates V and VI to decide what advantages Germany has over Britain (of distance, lowland routes, control of mountain passes, direct railway connections, inland waterways) for shipping to each of the following groups of areas:

1. Countries controlling parts of the International Triangle;
2. Poland, Lithuania, and the Soviet Union;
3. The wheat-growing Danube plains (in Hungary, Rumania, and Yugoslavia);
4. Switzerland and the Plain of the Po.

Access to ocean routes. During the same period, about three eighths of Germany's exports went to countries outside Europe. What advantages and dis-

advantages has Germany for trading by sea? Answer after considering the following points

1 Ocean routes over which German exports may move (Fig 28), and coasts where the routes reach German shores (Fig 235),

2 River routes leading into Germany from ports of the Continental Seaboard and the Baltic (Figs 253 and 258 and Plate VI), and relation of river routes to manufacturing districts,

3. Railway routes to ports of the Continental Seaboard (Fig 239),

4 Important river route that leads through a foreign country to reach the North Atlantic Trade Route (Fig 253),

5 Distance of German ports from the open Atlantic as compared with British ports, and danger zones where in war time an enemy fleet might cut off German access to ocean highways

Competition in distant areas In a recent three-year period, German exports to countries outside Europe were valued at less than half as much as British exports to those countries

1 The difference was particularly great in Southeastern and Southern Asia, where German sales were only a fourth as large as British sales What bearing may political ties have had on this contrast (p 682 and your map made for Exercise 1, Chap XXX)? In what countries?

2 The United Kingdom exported five times as much to Africa as did Germany, but British exports to South America were not very much greater than those of Germany In which of these continents may political ties have influenced trade?

3 In what countries of North America may language and national taste favor sales of British goods rather than German? In which North American countries may political ties give British exporters an advantage over their German competitors (Plate I and p 682)?

4 Is it probable that British exports to Australasia were much greater than those of Germany, or only a little greater? Why?

German Leadership in Chemical Manufacture. One July morning in 1916, American newspapers carried the startling announcement that a submarine, the *Deutschland*, had escaped through the British blockade and had reached New York with a small cargo of German dyes The news created general interest, both because the submarine was a new instrument of warfare, and because the supply of dyestuffs in the United States was getting low Some months earlier, when the British blockade cut Germany off from the great sea lanes, Americans realized to what extent we had been dependent on German chemical manufacturers Newspapers predicted that as soon as the supply of dyes in the country should become exhausted, Americans would be obliged to dress in white.

The prewar dye monopoly. The wartime shortage of dyes affected other textile-manufacturing countries, for before the war Germany had been furnishing about 75 per cent of the world's dyes. The German monopoly had developed gradually during nearly a century. At the time of the American Civil War the dyes of commerce were made chiefly in England and France. Certain English laboratories gave special attention to organic chemistry, and it was an English chemist who made the first coal-tar dye. The fame of the English laboratories attracted foreign students, and some of the early German chemists got their training in England. In the 1870's chemical manufacture developed rapidly in Germany, encouraged by the government, the banks, and the universities. Manufacturers employed chemists with university training and eagerly accepted their discoveries. By 1900 there were 500 chemists employed in German manufacturing establishments, while British manufacturers employed fewer than 50. German-made coal-tar dyes gradually replaced the vegetable and mineral dyestuffs known previously, and the world gradually came to depend on Germany for its dyes.

Loss of dye monopoly. Americans did not have to dress in white during the war as newspapers had predicted. American scientists and chemical manufacturers turned their attention to dye production, and before the war ended they were producing satisfactory dyes. With that start they perfected their processes, and within a decade they were supplying more than 90 per cent of the dyes used in the United States. In addition, they had secured a considerable foreign market for American dyes. Similar changes took place in the United Kingdom and France, and now many countries produce a large part of their own dyes.

Rank of chemical industry in Germany. Among the major groups of commodities exported from Germany, chemical products rank third, being surpassed in value by metal manufactures and by machinery and vehicles (Fig. 255). Coal-tar dyes stand at the head of the chemical list, but their export volume is only a third as great as in 1913. Germany's chemical output is exceeded by that of the United States, but Germany ranks first as an exporter, since American manufacturers produce mainly for domestic markets.

Export values do not reveal the full importance of chemical manufacture in present-day Germany, however. German attention is focused most feverishly on chemical manufacture as a means of supply-

Groups of Exports Value in Million Dollars		
Manufactures of metals		439
Iron and steel	340	
Nonferrous metals	90	
Machinery and vehicles		383
Electric machinery and wire	100	
Machine tools	54	
Textile machinery	40	
Land and air vehicles	59	
Ships and boats	19	
Other machinery and parts	112	
Chemical products		289
Coal tar dyes	54	
Medicinals	43	
Paints and varnishes	26	
Celluloid and products	15	
Photographic film	10	
Potash products	10	
Ammonium sulphate	8	
Lubricants	7	
Coal tar coal tar oils etc	5	
Others	111	
Textile manufactures		198
Rayon yarn and fabrics	52	
Woolen yarn and fabrics	51	
Cotton yarn and fabrics	47	
Other textile products	48	

Groups of Exports Value in Million Dollars		
Minerals, chiefly unmanufactured		174
Coal	108	
Coke and briquets	49	
Crude potash	10	
Clay and loam	5	
Ores and slag	2	
Articles valued largely for fine workmanship		107
Glassware	55	
Toys	15	
Clocks and watches	13	
Musical instruments	11	
Jewelry and other articles made from precious metals	8	
Table china	5	
Manufactures based on forest products		106
Paper and cardboard	68	
Manufactures of wood	13	
Wood pulp	9	
Rubber manufactures	16	
Animal skins and manufactures		54
Leather and leather goods	35	
Furs	19	
All other exports		171
Total value of exports		1921

FIG 255 Major groups of commodities exported from Germany in a recent year

ing the needs of German industries and the German people Chemical industries employ about 12,000 trained chemists and a half-million workers in thousands of factories, large and small, and from time to time huge new plants begin producing some new commodity

Nature of Chemical Manufacture. The processes of chemical manufacture are, in general, various combinations of those employed in chemical laboratories, such as grinding, mixing, roasting, distilling, compressing, and crystallizing Chemical manufacture produces substances bearing little or no resemblance to the raw materials used In this respect it differs greatly from such industries as cotton-spinning or flour-milling Still there is no sharp boundary between chemical manufacture and industries not so classed The changes that take place in a blast furnace are chemical in nature Among the industries ordinarily grouped under chemical manufacture are petroleum-

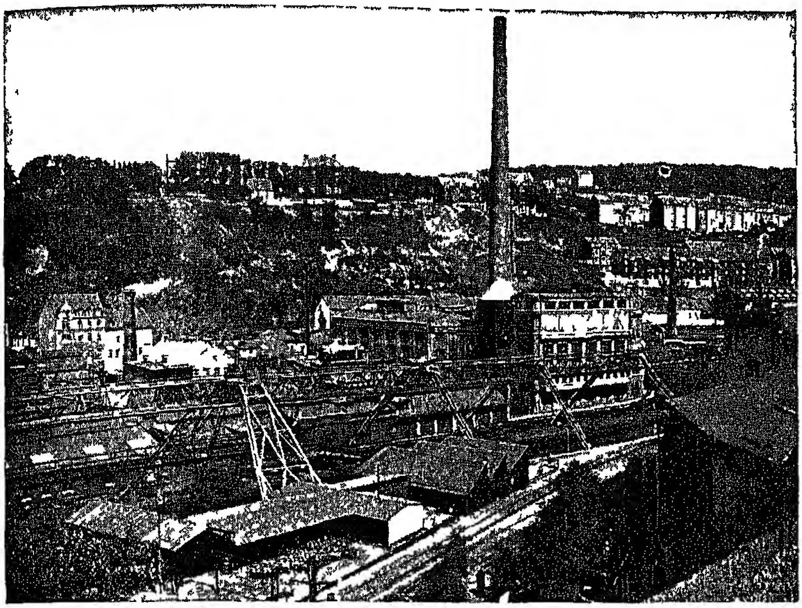


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FIG 256 Bayer Dye Works in Elberfeld-Barmen, Ruhr District Elberfeld and Barmen, located in the Wupper Valley a few miles south of Essen (Fig 253), have expanded up and down the narrow and rather deep valley until they have grown together They are principally textile centers, but they also manufacture chemicals and textile machinery Just beyond the building in the right foreground the picture gives a glimpse of the Wupper Above the river is the steel framework of the unusual car line that runs through the two towns The cars travel beneath the tracks, upbound on one side and downbound on the other, each car suspended from four wheels that run on a single rail

refining, the manufacture of nitrates from atmospheric nitrogen, and the manufacture of fertilizers, acids, soda products, and plastics

Main Groups of German Chemical Products. Besides their famous output of coal-tar dyes (Fig 256), German chemical factories produce hundreds of other commodities Important among these are industrial chemicals, fertilizers, and plastics. But no one of these lines is peculiar to Germany, for interest in chemical processes is widespread in manufacturing countries

Industrial chemicals Certain products of chemical manufacture are known as industrial chemicals because of their large use in other industries. To this group belong the acids, soda products, potash compounds, and bleaching powders. Industrial chemicals are nec-

essary for petroleum-refining, soap-making, glass manufacture, and the textile industries, for example Important among the materials for manufacturing this group of chemicals are common salt, potash, and sulphur The German output of industrial chemicals is consumed mainly in domestic industries, but many manufacturers in other countries depend on German potash

Commercial fertilizers Plants require many minerals for healthy growth, and crops are likely to leave the soil poor in some of these, particularly in minerals containing nitrogen, phosphorus, or potassium. A commercial fertilizer is considered "complete" if it contains nitrate, phosphate, and potash, but many experienced farmers prefer to buy the separate fertilizing ingredients and prepare mixtures suited to the needs of their own soils Germany ranks among the principal fertilizer-manufacturing countries The major part of its output goes to increase the yield of German farms, but Germany exports considerable quantities of fertilizer materials, particularly potash compounds

Modern plastics The large-scale manufacture of synthetic plastics has developed almost wholly since 1920 This line of chemical manufacture now furnishes materials for numerous articles in everyday use, such as buttons, combs, umbrella handles, certain gears in automobiles, and parts of telephones and radio sets Celluloid, cellophane, bakelite, and the safety layer in safety glass are familiar plastics, and the artificial textile fibers also belong to this group German chemists give much attention to plastics, but they are not alone in this A large and varied output comes from factories in the United States and from plants in other manufacturing countries

Distribution of German Chemical Plants. Chemical manufacture has a wide distribution in Germany Each of the major German manufacturing districts engages in this line of industry (Fig 257). The several districts differ somewhat in their interests Berlin has a diversified output in harmony with the needs of a metropolitan district Saxony holds an outstanding rank in fertilizer manufacture The principal dye works are on or near the Rhine (Fig 256), in both the Ruhr and Southern Germany districts Each of the districts also contains large plants which manufacture industrial chemicals principally for local consumption.

German Fertilizer Manufacture. Recent years show much activity in the German fertilizer industry. At Merseburg, some 18 miles west

of Leipzig, is the largest of the many chemical factories operating in the Saxony District Activities at Merseburg center about fertilizer manufacture, but new departments and new lines of manufacture are added as science reveals new possibilities in the materials employed The works and grounds cover several square miles, the elaborate equipment includes all the apparatus of the chemical laboratory on a giant scale, and the huge storage tanks are large enough to hold 1,000,000 tons of fertilizer material The plant employs thousands of people, including a large force of highly skilled workers and many scientists with university training in chemistry

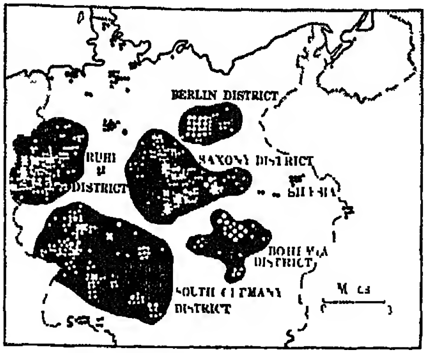

FIG 257 Principal manufacturing districts of Germany

Securing raw materials German manufacturers draw upon both domestic and foreign resources to secure the three essential ingredients of commercial fertilizer Merseburg is located at the margin of an area rich in potash (Fig 258) Germany has no large deposits of mineral nitrates, and one important business of the Merseburg plant is to manufacture nitrates from the nitrogen of the air A "sister plant" is in operation on the middle Rhine, and nitrates produced in Germany are sufficient for the national needs Phosphate requirements are met in part by the purchase of slag from the blast furnaces that smelt Lorraine ores, but phosphate rock from Florida and Northern Africa is imported through Hamburg and comes up the Elbe to supplement the domestic supply

Using resources scientifically Research goes hand in hand with manufacture in the fertilizer industry Two lines of investigation have important bearings on the activities of the manufacturing plants Scientists are trying to find out (1) what the soil needs and (2) how the natural resources of Germany can be made to serve these needs. Progress along both lines is indicated by the announcement of new discoveries from time to time For example, manufacturers, by putting the essential minerals together in different combinations, have devised fertilizers specially adapted to various types of German soil,

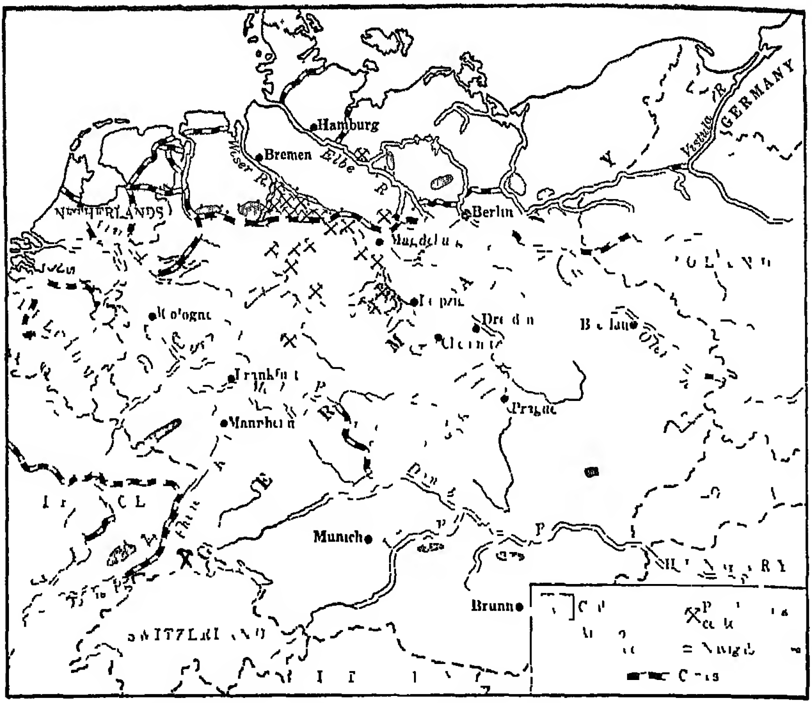

FIG 258 Distribution of potash and coal in Germany

from sand to heavy clay They use peat in a new brand that is becoming popular for horticulture. One of their new brands of fertilizers is particularly suited to the export trade, they claim, because its high fertilizing value for a given bulk reduces transportation costs—an important consideration for the fertilizer trade

Leadership in Chemical Manufacture Based on Mineral Resources. German leadership in chemical manufacture is based largely on resources of four minerals—potash, salt, sulphur, and coal. These minerals are needed in huge quantities for the manufacture of industrial chemicals Because industrial chemicals are bulky and low-priced commodities, freight charges form a big item in their cost Therefore manufacturers choose a location at which the raw materials can be assembled cheaply, and from which finished products can be shipped cheaply to market The German plants have the advantage of being located near abundant resources of potash, salt, sulphur, and coal, and the European Manufacturing Belt constitutes a big near-by market.

German potash resource. Beneath the surface of central Germany potash minerals lay unnoticed for ages until science revealed their value. Then they became a means of developing improved agriculture, great chemical industries, and a big export trade. For a long time no large deposits of these minerals were known to exist outside of Germany, and German mines furnished nearly all the potash used in the world.

During the World War, agriculture in the United States and other countries suffered on account of the potash shortage, for potash-hungry soils give poor yields. Many other industries suffered too, for potash compounds enter into the manufacture of glass, soap, and explosives; they are necessary for the manufacture of photographic supplies and coal-tar dyes; and the cyanide used in separating gold from its ores is a potash compound.

Germany's potash monopoly, like its dye monopoly, has been lost. The fortunes of war gave to France the small Alsace field, situated near the Rhine, and France became a competing exporter. Search for potash deposits was made in many countries. Now nearly half the potash used in the United States comes from domestic sources—a dried-up lake bed in California, mines in southeastern New Mexico, and a few cement plants that recover potash from flue dust. Spanish deposits near Barcelona yield potash for domestic use and for export. Soviet production increases from year to year, valuable deposits having been found north of Perm. Still Germany produces more potash than all the rest of the world, and nearly a third of its output goes to foreign markets.

Germany's potash deposits have a location convenient both for supplying domestic consumers and for export. The mines are scattered throughout an area extending from Leipzig nearly to the North Sea (Fig. 258). Thus they lie between the Ruhr District and Berlin and extend well into the Saxony District. In contrast, the Soviet deposits and those of the United States lie far inland and far from important manufacturing districts.

An extensive system of inland waterways furnishes cheap transportation from potash-mining localities to German manufacturing districts and ocean ports. The Elbe and Weser flow through the area, offering water routes to Hamburg and Bremen, and branch canals form a network in the mining area (Figs. 258 and 259). Upstream the Elbe leads through the heart of the Saxony District and into

Bohemia Canals connect the Elbe with the Oder, by way of Berlin, and the water route continues up the Oder to Silesia On the west a canal route leads from the Weser into the Ruhr District and to the Rhine This route, in addition to serving German factories in the International Triangle, gives access to the markets of Belgium and the Netherlands, which consume large quantities of German potash

Importance of German salt resource Germany's salt deposits are an important factor in the success of the German chemical industries Common salt is the basic material for the manufacture of a valuable group of industrial chemicals, including the soda products, hydrochloric acid, and the chlorine bleaches These are essential in the textile industries and for numerous processes of chemical manufacture. The German supplies of salt are enormous, and salt works are operated in many localities A vast body of rock salt underlies the potash beds. The value of both salt and potash is the greater because they occur close together, with a fuel supply near at hand

Where the Germans get sulphur German industries use large quantities of sulphuric acid, one of the most important of industrial chemicals Sulphuric acid is necessary for many large modern industries—petroleum-refining and the manufacture of paper, rayon, explosives, fertilizers, and coal-tar dyes, for example In fact, the amount of sulphuric acid consumed forms a pretty good measure of the activity of manufacturing industries in a country or during a particular year The production of this much-used acid requires sulphur or some sulphur-containing mineral

As their principal raw material, German manufacturers of sulphuric acid use iron pyrite, a mineral valued mainly as a sulphur ore They get part of their pyrite supply from mines near the margin of the Ruhr District, but they import much greater quantities from Spain, Norway, and Italy They also prepare considerable quantities of acid from the sulphur gases given off in coke manufacture and in the smelting of zinc and copper ores This by-product industry makes the coke ovens and smelters less disagreeable neighbors, for escaping sulphur gases are unpleasant to breathe and injurious to the vegetation of the surrounding area

Relation of coking coal to German chemical trade Coking coal is of fundamental importance in German chemical manufacture, serving both as a raw material and as a fuel to supply the necessary heat and power Under the magic treatment of science, coal tar, re-

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FIG 259 Loading potash into boats on a German canal

covered as a by-product in making coke, yields a long list of valuable products, including dyes, medicines, photographic chemicals, perfumes, and flavors The coking process also yields nitrates (in the form of ammonia products) and thus contributes to the manufacture of both fertilizers and explosives Most of the coking coal comes from the Ruhr mines, and thus Ruhr coal is one of Germany's most precious resources Its value lies in its abundance, its superior quality, and its convenient location Dye plants situated along the Rhine have the advantage of nearness both to the Ruhr coking plants and to the many textile factories of the Continental Seaboard (Figs 256 and 253) In addition, they are well placed for shipping their output by sea to Britain and other foreign countries

Value of Germany's brown coal German chemical manufacturers make large use of brown coal, or lignite This soft and crumbly fuel is abundant in Germany and occurs in the interior of the country, where high-grade coal is lacking. Of particular significance is the fact that the potash-producing district also contains lignite deposits Although lignite has a low fuel value, German chemical factories use it profitably in localities where they can get it without paying freight charges For example, the big Merseburg chemical plant stands on a lignite field and uses no coal from elsewhere This field

contains lignite of relatively high quality, which lies so near the surface that it is mined by open-pit methods similar to those of the Mesabi iron-mining district (pp 313–314) In the Mersebuig chemical plant, lignite serves both as fuel for heat and power and as a raw material for the manufacture of synthetic motor fuel

Chemical Manufacture to Reduce Import In recent years a number of Western European countries have been working to build up domestic industries by cutting down imports Thus a few years ago the British government decided to charge high import duties on fresh vegetables during the months when English gardens are producing, the Spanish government restricted the import of peanuts for the sake of olive-oil producers, the French government limited the import of Spanish wine in favor of that produced in France and French Africa, Italy placed a high import duty on wheat in order to increase the domestic crop, Germany has formed government committees to regulate the import of nearly all commodities and is striving to provide chemical substitutes for many foreign products While reducing imports, each country wishes to export as much as possible One country cannot export, however, unless some othei country will import, and thus efforts to cut down imports tend to reduce the volume of international trade

In the political management of trade and production, the most typical German measure is the search for chemical substitutes A government committee directs all research, industries work according to the government plan, and chemical manufacture is expanding along many lines Germany ranks among the leading producers of rayon and other artificial fibers The manufacture and use of plastics shows remarkable growth The production of synthetic rubber has gone far enough so that some government motor vehicles are equipped with tires of the new material The potash industry furnishes valuable chemical by-products, among which is magnesium, a useful material for the light-metal alloys needed in airplane manufacture Particularly spectacular are the efforts to find substitutes for imported gasoline and the oils used in manufacturing processes

Motor fuels Lacking important resources of petroleum, Germany has been obliged to depend on foreign sources for petroleum products. This dependence proved inconvenient during the World War (p 335) Now domestic sources provide more than half the motor fuel used in the country The shift to domestic fuels has come about

gradually, while chemical manufacture progresses toward the goal of transforming German materials into gasoline The story of the change illustrates the way in which the government, scientists, and manufacturers work together It also shows that each industry depends on others

Alcohol plays a large part in the struggle for German independence of foreign oil In the early 1930's the government placed a high duty on imported gasoline and required that all dealers add a stated proportion of alcohol to the gasoline imported or obtained from German refineries Most of the alcohol was made from potatoes, however Thus the production of motor fuel took the output of land that otherwise might produce human food or stock feed—and Germany also wants independence in its food supply At length chemists found a way of making industrial alcohol from the waste liquors of wood-pulp manufacture, and this product is replacing alcohol made from potatoes

Later steps include the increased use of benzol as a motor fuel This material is obtained mainly as a by-product of coke manufacture (p 301), but the government requires city gas plants to have equipment for recovering it Chemists have continued their experiments in producing synthetic gasoline from lignite, and large-scale production has begun

Fats and oils The need for fats in food and in manufacturing industries ties Germany commercially to other countries Imports include butter, edible oils and fats for the manufacture of butter substitutes, and industrial oils for making soap, mixing paint, and many other purposes The country produces only about half of its requirements, and part of the butter made in Germany depends on imported stock feed Success in preparing a synthetic stock feed would help to solve the problem of dependence on foreign oils

The soap industry illustrates the efforts of government and science to break another commercial tie Soap manufacture in Germany requires nearly 250,000 tons of imported vegetable oils annually In the effort to reduce this amount, manufacturers have brought out new products which act like soap, but which are made without fats or oils For the purpose of reducing the amount of soap needed, the government installed municipal water-softeners throughout the country, the type of softener in each section being adapted to the chemical nature of the water. Then the people were urged, by radio broadcasts, to

avoid wasting soap Recently a big chemical plant began the large-scale manufacture of a synthetic material that can take the place of oils in soap manufacture

Business Organization Contributes to Success. By combining their efforts, German chemical companies have made themselves much more powerful in competing for world markets than they could be if each worked independently A single organization controls more than half the capital engaged in German chemical industries and still is growing This organization is an association, or "cartel," made up of the most powerful chemical concerns in the country While the individual companies continue to operate, they agree to pool their raw-material resources and to share their profits They agree also that all members shall have the benefit of new processes discovered by any member of the cartel The companies co-operate with one another, therefore, instead of competing, and increasingly they operate under government control

What Chemical Industries Mean to Germany. German chemical manufacture is an example of notable skill and progress in utilizing the natural environment Science has found new values in the iron ore, coal, air, potash, and other natural resources bestowed by nature upon the land By taking advantage of these values, a big steel industry has been developed, a huge trade in coal products has been built up, and the yield of the soils has been increased In addition, considerable progress has been made toward finding satisfactory substitutes for the highly prized resources which nature denied to Germany. Chemical manufacture is truly typical of German industry It touches nearly every phase of German life, it is characterized everywhere by scientific methods, and it is dominated by a business organization so huge as to attract the attention of the world

QUESTIONS

1 What reasons had American newspaper writers for thinking that Americans would be unable to buy colored clothing during the war of 1914–1918?

2 How is German steel manufacture aided by the dye trade?

3 What advantages has the International Triangle for the manufacture and sale of dyes?

4 What resources of the Saxony District are important for manufacturers producing industrial chemicals? Where do manufacturers in the Saxony District find the nearest market for industrial chemicals?

5 A number of important British plants engaged in manufacturing industrial chemicals are located between Manchester and Liverpool, near the place where the Manchester Ship Canal is joined by a branch waterway leading to the salt-producing area some 10 to 15 miles south of the Mersey Show how this is a logical location for assembling raw materials Where is the nearest market for industrial chemicals?

6 France produces potash for domestic use and for export In what part of the country are the mines (Fig 258)?

7 German farmers get large yields from soils of medium quality How does this fact depend upon German mineral resources and German manufacturing industries?

8 Where do German manufacturers get phosphates, potash, and nitrates for the manufacture of fertilizers?

9 Chile at one time furnished nearly all the nitrates used in the world for the manufacture of commercial fertilizer Why does it now furnish only a small part of the world supply?

10 Why did the interruption of trade with Germany affect crop yields in the American horticultural districts during the war years, 1914 to 1918?

11 What facts can you give to illustrate the statement that chemical manufacture is typical of Germany?

EXERCISES

1 *Minerals for German factories*

Prepare an outline under the title "Possible sources for German mineral imports"

Among the minerals imported into Germany are phosphate rock, pyrite, sulphur, mineral nitrates, petroleum, and copper

Use the names of these minerals as the main headings of your outline Under each heading list the names of the principal areas (Fig 27) that produce the mineral

2 *Landscape study in the Ruhr District*

a Reading the landscape Study Figure 256 to identify the following types of area (1) level land used for manufacturing, (2) level land used for transportation, (3) water area used for transportation, (4) hilltop used for residence, (5) terraced slope used for residence, (6) hilltop devoted to forest, (7) steep slope marked with paths but otherwise idle

b Interpreting what you see Write a paragraph entitled "A dye manufacturing locality in Elberfeld-Barmen" Let your paragraph contain the following points

(1) Nearest market for the output of the factory,
(2) Probable bearing of market on location of factory,
(3) Evidence that factory uses fuel, and probable source of the fuel,

(4) Advantage of having dye factory located near to Ruhr coking plants,
(5) Advantages of location for securing the large quantities of water needed in chemical manufacture,
(6) Nature of Wupper Valley —
  (*a*) Approximate depth of valley as estimated from buildings on terraces (less than 50 feet, 200-300 feet?),
  (*b*) Steepness of valley walls (gentle enough to hold soil against washing, steep enough to be damaged by running water during rains?),
  (*c*) Width of valley floor (probable number of streets between the river and the foot of the slope);
(7) Possible relation between location of car line and nature of valley,
(8) Indication that workers live near the factory,
(9) Suggestion that there are attractive places near at hand for the family picnics of which Germans are fond

CHAPTER XXXIII

FRANCE, A COUNTRY OF MANY INTERESTS

1. *The Country and Its Resources*

France Characterized by Variety. France is the only country that touches both the Narrow Seas and the Mediterranean. It occupies a broad area extending from the English Channel across plain, hill country, and mountain belt to the Mediterranean shore (Figs 230 and 260) Thus various sections of the country differ in resources and industries France shares the mineral wealth and large-scale industries of the International Triangle, it shares the rich forest and water-power resources and the tourist attractions of the Alps, it has the advantages connected with owning a section of the Mediterranean border

The manufacturing North The European Manufacturing Belt extends into France far enough to include Paris, the manufacturing communities along the Seine, and the Lorraine District (Figs 235 and 260) At the west it includes the many French ports that look out upon the Narrow Seas, and at its eastern extremity is the Rhine port of Strasbourg, which handles a large volume of trade between the Ruhr and Lorraine districts The textile, chemical, and metal products of the North find markets in many parts of France and in foreign countries. Northern France also has much intensively worked farm land which produces wheat and sugar beets and furnishes milk, fruits, and vegetables for city markets

The Normandy-Brittany peninsula The hilly peninsula of Normandy and Brittany, extending westward between the English Channel and the Bay of Biscay, furnishes an important part of the French beef and butter supply Having mild temperatures, plenty of rain, and much cloudy weather, its farm land is devoted mainly to pasture The fishing fleets that go out from its many small harbors help to supply the markets in the interior of the country.

Hill country of Central France The hill country of Central France is separated from the Alps by the Rhône-Saône Valley Its upland farms produce chestnuts and famous varieties of cheese, while valley-bottom farms furnish horticultural and dairy products Scattered deposits of ores and coal have been worked for a long time In most cases the metal industries are on a small scale, but the hill country of

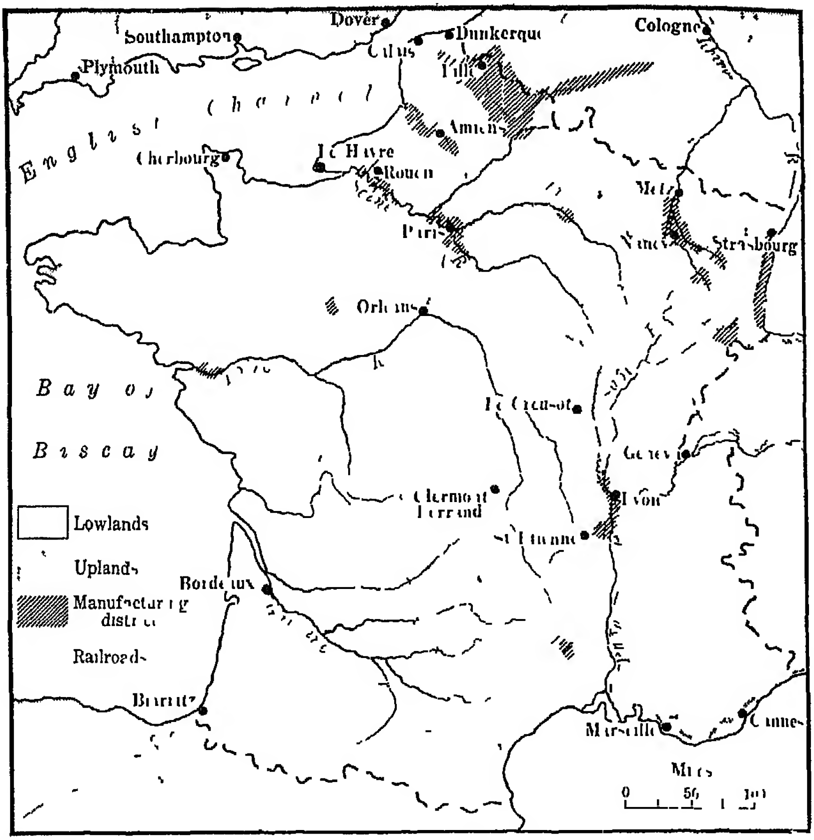

FIG 260 Principal land forms, railroads, and manufacturing districts of France

Central France contains the important iron and steel center of St. Étienne, the large factory for war materials at Le Creusot, and the most important rubber factories of the country at Clermont-Ferrand

The Aquitaine lowland Between the Bay of Biscay and the hill country of Central France is the Aquitaine lowland, largely devoted to agriculture It produces famous varieties of wine in the area about Bordeaux, it sends daily trainloads of fruits and vegetables to the Manufacturing Belt during the summer months, and its co-operative dairies ship butter to Paris In addition, the pine forests planted on sandy tracts and drained marshes along its coast yield naval stores and mine timbers

The Colonial Empire of France. The French flag flies over widely scattered areas outside of Europe France holds small areas in both

North and South America, it controls many tropical islands, the largest of which is Madagascar, the tropical colony of French Indo-China is nearly as large as Texas and has a much larger population But the colonial territory of France lies mainly in Africa

African territory of France French Africa covers more than a third of the continent It extends from the Mediterranean coast across the Atlas Mountains and the Sahara to the Guinea coast and the Congo River (Plate VIII). It includes wheat and vineyard land near the Mediterranean, semiarid grazing areas on uplands back from the coast, arid grazing lands and date-producing oases in the Sahara, plains in the wet and dry tropics of the Sudan, and humid tropical plains with dense forests on the Guinea coast Northern Africa has cork forests on some of the Atlas Mountain slopes, and it has valuable mineral deposits, particularly phosphate rock and iron ore

Success in managing a desert colony French Africa is notable for the vast area of desert which it contains, but it has a third as many inhabitants as the United States In managing this area, the French have faced difficult problems growing out of the fact that North Africa contains groups of people with very different ways of living Life in settled communities is suitable for the Mediterranean border, with its fairly dependable rains It is suitable also for the oases in the northern part of the Sahara, where streams from the mountains provide irrigation water But only nomadic herdsmen have found a way of living in the great arid stretches of the Sahara, where the year may pass without even a shower

Difficulties are most likely to occur when drought forces the nomads and their flocks northward into agricultural country in early summer Formerly the annual migrations were accompanied by raids and warfare, for nomads and farmers were traditional enemies The French government has been remarkably successful in dealing with these problems Realizing that both groups have rights, it manages the area in such a way that farmers and nomads live according to their own customs and trade in peace with each other

French interest in colonial industries The French, like the British, have taught native people in their colonies to produce commodities for export Algeria produces more wine for export than does any other country of the world The French colonies of Mediterranean Africa produce much of the wheat imported into France and furnish more than half the phosphate rock imported into countries of West-

ern Europe. French Indo-China is one of the three major world sources of export rice. The French West Indies produce sugar and spices for export Madagascar ships tropical specialties, among which are vanilla and raffia French colonies on the Guinea coast have begun shipping bananas to France Exports from French colonies find their principal markets in France, and trade privileges encourage colonial peoples to buy French products

Naval and military strength. Holding a larger colonial empire than any other nation except Britain, France has need for naval and military forces as means of assuring peace and protecting routes to its colonies. It may well be content with naval strength considerably below that of Britain, since its colonies are smaller and somewhat less widely scattered However, France ordinarily maintains a much larger army than does Britain, and the colonial force makes up less than a third of the French army. Strength of land forces reflects the continental location of France and the international distrust that afflicts Europe France might be invaded either from the sea or across any one of six international boundaries, whereas an enemy could attack Britain only after crossing a sea barrier.

French Interest in Inland Transportation. France has more miles of railroad, more miles of automobile highway, and more miles of inland waterway than any other country of Western Europe except Germany It also ranks high in the amount of freight shipped by rail and in the number of motor vehicles registered. But it has a smaller ocean-going fleet than the United Kingdom, Germany, Norway, or Italy.

Attention to inland transportation is logical for France. The country covers a larger area than any of its neighbors except Germany, and it has a large domestic trade. Thus it needs a large mileage of transportation routes in order that contrasted sections may have communications with one another Furthermore, a large part of French foreign trade crosses land boundaries, and certain French routes have international importance.

Trunk lines of inland transportation In France, as in England, the lines of heaviest traffic point to the capital city as the principal market and distributing center. Nature arranged lowlands and rivers in such a way as to make the site of Paris a convenient one for trading with all parts of the country (Fig 260), and the improved transportation routes of today conform to the natural pattern.

On the side toward the English Channel, the Seine and many land routes lead to the coast On the opposite side, routes radiate to the German, Swiss, and Italian boundaries and to Mediterranean ports. The Seine and its tributaries provide several waterways into the hill country of eastern France, and canals have been cut across low divides to connect these waterways with the Rhine and the Saône. Waterways, railroads, and highways form extensive transportation systems with main lines focusing on Paris (Plates V and VI).

International value of French routes Because France has an isthmus-like location in Western Europe (Plate V), its railways handle a good deal of traffic between countries on the south and those on the north. On the south, French lines connect with those of Spain and Italy, on the north the trains may continue beyond the border, traveling over German or Belgian lines; and frequent ferry services make connection with British railways. Hence French lines furnish the quickest rail routes for mail, passengers, and perishable fruits and vegetables moving from Spain and western Italy to points in the Manufacturing Belt

French railways are of interest also to long-distance mail and passenger traffic At the west the Orient Express, fast train to Southeastern Europe, uses a French railway line, running eastward from Paris to cross the Rhine at Strasbourg. On the long voyage from Buenos Aires to Antwerp or Berlin, several days can be saved by landing at a port of northwestern Spain and traveling by rail through Paris An even greater saving of time can be made between Suez and London by transferring to railway at Naples or Marseille.

Major Gateways to the Sea. The sea-borne trade of France moves through some twenty ports that look out on the Mediterranean, the Bay of Biscay, and the Narrow Seas About three fourths of the total volume is handled by Marseille and a half dozen Narrow Seas ports. Marseille dominates the Mediterranean trade of France and ranks among the major ports of Europe Le Havre is the most important Narrow Seas port of France Bordeaux, the principal port of the Biscay coast, serves a famous vineyard area.

Trade and Industries of Marseille. Marseille ranks first among French ports in the number and size of the ships that enter its harbor and in the total value of the freight handled It trades principally with Mediterranean countries and with areas beyond Suez, but it also has transportation services to many lands. Among its typical

imports are wheat and phosphate rock from French North Africa, coal from the United Kingdom, peanuts from India and West Africa, copra (coconut meat) from Southeastern Asia, soybeans and raw silk from Eastern Asia, palm oil from Tropical Africa, and olive oil from Italy and Spain

Marseille has large manufacturing industries associated with its trade Many mills grind North African and Italian wheat. Its big trade in oilseeds and vegetable oils has grown out of the manufacture of soap, a long-established industry in Marseille. In early days the soap was made from olive oil produced in Southern France Caustic soda (lye), the other necessary ingredient, was made from salt obtained locally by evaporating sea water The soap industry has outgrown the local supply of oil, and Marseille now draws on worldwide sources The crushing of oilseeds has become an important industry, and Marseille ships vegetable oils to Paris in addition to supplying its own needs The preparation of soda products led to other chemical industries, among which are the manufacture of sulphuric acid, the production of fertilizer from phosphate rock, and the first process in the manufacture of aluminum (Chap XXXIV)

The Seine Gateway. The Seine estuary forms the main entrance for Atlantic and North Sea traffic en route to Paris From Le Havre to Paris the Seine is a much-used barge route, and the channel has been deepened to admit ocean-going vessels of moderate size as far upstream as Rouen (Figs 240 and 261) The tonnage of goods entering by the Seine Gateway exceeds that received at Marseille, but the traffic is divided between Le Havre and Rouen. The export volume is only half that of the great Mediterranean port, but the exports shipped through Le Havre have a remarkably high average value per ton

Trade of Le Havre. Le Havre, at the mouth of the estuary, has a harbor that can accommodate the huge liners used by modern transportation. It is the principal Seine port It trades with the United Kingdom, with Baltic countries, and with the Americas, but it also has transportation services connecting it with the Orient and West Africa It ranks especially high as an importing port, receiving wheat from Argentina and Canada, cotton from the United States, lumber from Baltic countries and Pacific North America, coffee from Tropical America, and frozen meats from Middle Latitude South America. It also deals in such colonial products as cabinet woods and cacao

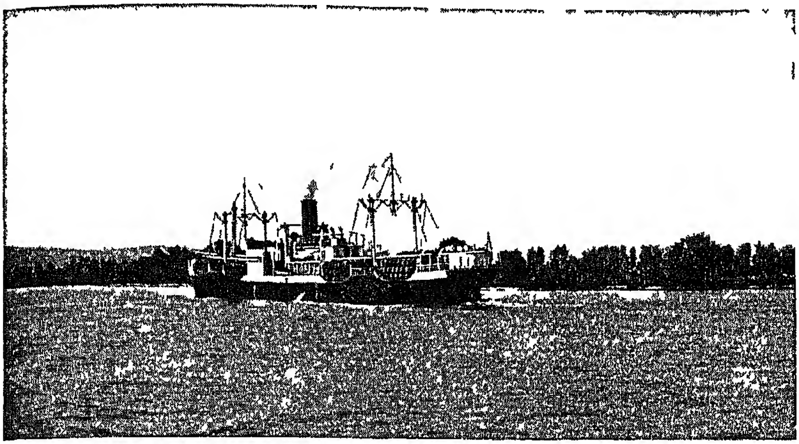

FIG 261 Ocean vessel of Algerian Line steaming down the Seine with deckload of empty wine casks taken on at Rouen

from Tropical Africa, bananas from the French West Indies, and rice and pepper from French Indo-China.

Le Havre imports most of the cotton and coffee consumed in France Big warehouses are devoted to the storage of these commodities (Fig 262), and Le Havre companies are organized to sell abroad as well as in the principal consuming centers of France. The cotton and coffee trade of Le Havre is so large that dealers keep in close touch with New York and other world markets. Business at the Cotton Exchange may drag during the morning hours, but there is an air of impatient waiting just before three o'clock in the afternoon Then cable or radio messages announce the opening prices for the day's cotton trade in New York. The place becomes feverishly alive, and brokers rush to telephone booths to place orders overseas or to bargain with customers in Europe

Trade of Rouen The port of Rouen handles a larger import tonnage than any other French port, but it deals mainly in a few bulky commodities. Coal, petroleum, and wine make up the principal cargoes carried by ocean vessels up the Seine to the head of navigation at Rouen. The rates charged by coal-carrying tramp ships are the same whether they deliver the coal at Le Havre or take it to the head of navigation, 80 miles from the sea Rouen is one of the major French refining centers, and tankers deliver crude petroleum to the storage tanks of refineries located on an island in the Seine. Ships of the

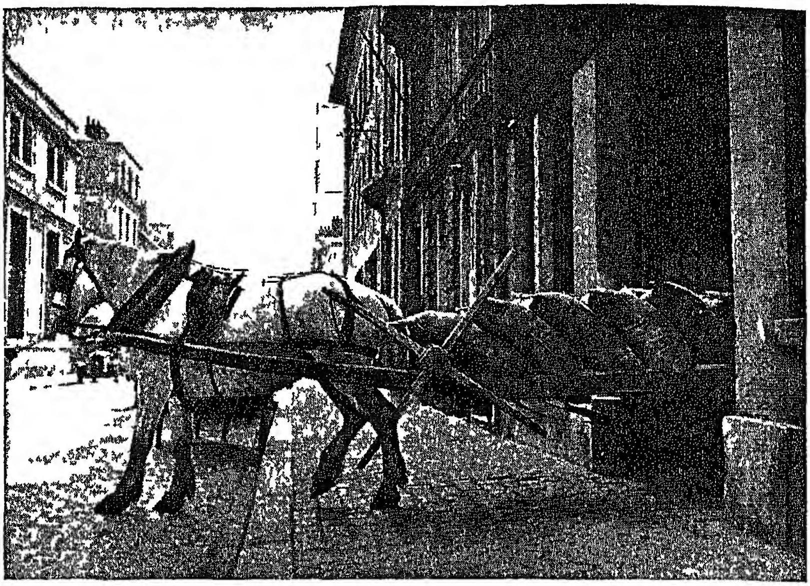

Fig. 262 Load of coffee being taken from one of the warehouses in Le Havre

Algerian Line bring wine in large casks and unload their cargoes at special docks below the city, where they may also take on Rouen cotton manufactures and empty wine casks for the return voyage (Fig 261) Though Rouen is a cotton-manufacturing city, it does not import cotton Its manufacturers get their raw material from dealers in Le Havre.

Commerce of France. In value of commerce, France ranks third among the countries of Western Europe, being surpassed by the United Kingdom and Germany (Fig 229) To a large extent French trade is concerned with near-by areas The exchange of goods with neighboring countries of Western Europe and Mediterranean Africa accounts for more than half the value of French exports and imports Algeria ranks first in value of trade with France, then follow Germany, Belgium, the United Kingdom, and the United States, though not always in the same order. Trade with French colonies accounts for more than a fourth of the total.

Like the United Kingdom, France exports manufactured goods and imports foods and raw materials. France is somewhat less dependent on imported foods than is the United Kingdom, for it has more cultivated land and a lower average population density. Tex-

tiles are important in the trade of both countries Both trade in mineral products, but the United Kingdom exports large quantities of coal and imports iron ore, whereas France exports large quantities of iron ore and imports coal.

Two contrasted groups of commodities are prominent among French exports Bulky mineral products (especially iron ore and iron and steel products) rank first when measured on the basis of weight Textile manufactures, together with such related products as clothing, jewelry, perfumery, and soap, rank first in value The former group consists mainly of French materials, and the export reflects the natural wealth of the country. The textile group—including fabrics of cotton, linen, wool, silk, and rayon—consists largely of articles made from imported materials This group speaks of French skill Of all the branches of the textile trade, the export of clothing, based on artistic talent and an established reputation, is most typically French

2 *Paris as a Fashion Center*

European Travel and French Export Trade. Annually thousands upon thousands of people from many countries visit Paris, some on business and others for pleasure Paris welcomes them all, for their pilgrimages mean much to French industry and trade. Among the crowds of tourists that throng the streets of the famous capital are many who will come away, after a brief stay, with Paris gowns in their trunks Twice a year, buyers from big American department stores crowd the eastbound transatlantic liners, and a few weeks later their purchases help to swell the cargoes of vessels sailing from Le Havre for New York. Many foreign correspondents of newspapers live in Paris and help to spread the fame of a great French industry by writing "Our Paris Letter" for the fashion page The Mecca of all these lovers of beautiful garments is the short but crowded Rue de la Paix in the heart of Paris (Fig 263), where modistes pay fabulous rents for very modest quarters

The Dressmaking Industry. The fashion trade of Paris differs greatly from commerce in factory-made products, for it deals largely in single frocks, each valued for its individuality Generally the garments are made to order If the customer is buying for her own wardrobe, a costume-designer creates or modifies the design to suit her

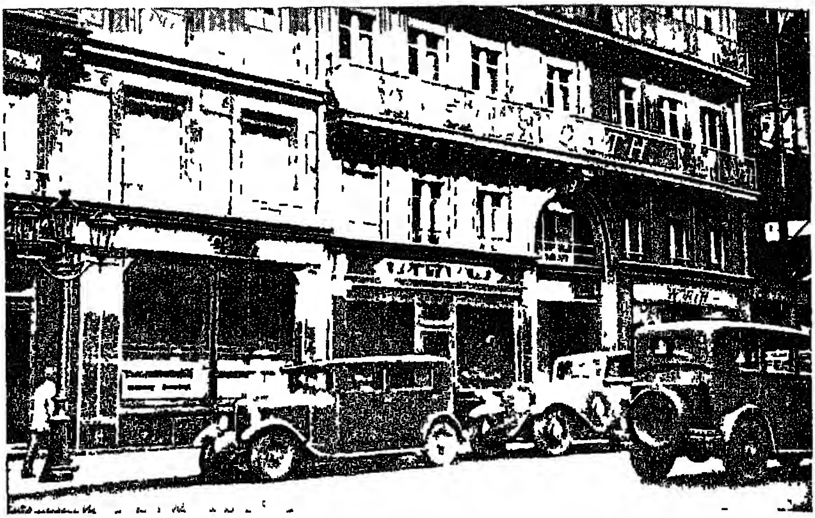

Fig 263 Center of the world's interest in fashion—Worth's establishment in the Rue de la Paix

personality The dress, in effect, is made on its future wearer Of course she expects to pay high prices for such service

Creating the season's mode The fashion trade makes a gala occasion out of the change of seasons. According to well-established custom, the principal dressmaking firms (*couturiers*) display their new models at February and August openings which are formal social functions. Preparations have been going on for months. Each firm has had artists and designers working in the greatest secrecy and has spent thousands of dollars, though only a single sample of each design has been made Foreign buyers of every nationality, trusted fashion correspondents, and leaders in society and fashionable sports attend the openings as invited guests Refreshments are served, while beautiful young women walk gracefully about, clad in the new models offered to the world of fashion.

The final word is not spoken by the couturiers, however, for many features of the new designs fail to please the leaders of fashion. Those who would know certainly the trend of the season's mode go next to Cannes, Biarritz, St Moritz, or some other fashionable resort, and note what the élite are wearing. By the time of the midseason openings in May and November the leaders have made their choice, and then Paris speaks in tones of authority.

Special relations with customers. Secrecy and surprise being important devices of the fashion trade, the famous Paris firms sell their goods without the elaborate advertising practices which are customary in many lines of business. They do not display their stock in show windows facing the street, for in Paris there are scores of "dress pirates" who copy designs instead of creating them. New customers must be introduced, and great care is taken to prevent "fashion spies" from getting invitations to the semiannual openings. Even the companies that sell to the large American stores ordinarily do not maintain large stocks and richly furnished salesrooms. Instead, they show models and take orders for dresses to be made up.

Manufacturing division of the industry. The dressmaking industry is said to employ more than 200,000 people in Paris alone. Contractors direct the manufacture of clothing, but the actual sewing is done by people who work in their own homes. A certain Paris wholesale house, for example, has a working force of 150 in Paris and its suburbs, and in many rural districts it maintains branch offices from which work is distributed to the wives and daughters of farmers.

The business of Mme. P— illustrates the relation between the dressmaking firm and the people who do the work. She takes orders from the wholesaler, who also furnishes the material, but she works at home. When orders are plentiful she employs other women to help her, and her living room becomes her workshop. She pays her helpers by the piece and is responsible to the firm for the quality of the work. One of the serious handicaps of the business is the extreme seasonal variation in the amount of work to be done. In the rush seasons Mme. P— works fifteen hours a day and in addition employs five or six other workers. In slack seasons, on the other hand, she is practically idle.

Fashion Trade Is Typical of French Industry. The export trade of Paris centers about articles of fashion, particularly clothing; and Paris, as the principal commercial center, reveals the major interest of France. Not only frocks but also such articles as gloves, shoes, millinery, jewelry, and furs are offered for sale in the fashion center. In fact, everything required for a complete wardrobe is the business of Paris. In addition, Paris makes a specialty of supplying fine cosmetics, exquisite perfumes, and whatever is needed to equip milady's dressing table in the most luxurious manner. The myriad articles for sale in Paris have been gathered from every part of the country. Into

their making have gone earnest thought, artistic taste, and fine workmanship They represent the true spirit of French industry

Why Paris Rules the World of Fashion. How does it happen that Paris can dictate to the world on matters of dress ? This position was gained little by little Leadership in France came first, and then the fashion center extended its sway to other countries In gaining and maintaining this leadership, the French have made use of artistic talent in creating costume designs, technical skill in making and handling their materials, keen business ability, and an understanding of the psychology of the fashionable world

The capital has prestige in France Paris, as the capital of France, is the center of French social life In this respect, however, it is similar to other capitals, for very commonly the people of a country look to the wealthy and governing classes of the capital city for their fashions and their rules of social conduct The prestige of Paris differs from that of other capitals in that its dictates in matters of dress are heeded throughout the Western world

Military strength brings international prestige It took several centuries for Paris to gain international leadership in fashions At various times in the last 350 years, France has occupied a position of notable prominence During the reign of Louis XIV, particularly, France was the strongest military power of Europe The social doings of the luxurious French court drew to Paris the royalty and nobility of Europe. French became the language of fashion and the language used in dealings between governments French manners, dress, and literature became models for the Western world The prestige of Paris never has been lost entirely That city, as the most readily accessible of the great capitals, frequently has served as the meeting place for international gatherings of great social and political importance

Industry capitalizes social prestige The social prestige of Paris was crystallized into leadership in fashion in relatively recent times About the middle of the last century there was a period of transition from the former slow, almost imperceptible changes of style to the fickleness of modern fashions Better transportation encouraged people to travel more The use of machinery enabled textile manufacturers to turn out a larger volume of dress goods and thus made frequent style changes feasible. Worth, who became the first great designer of French fashions, was an Englishman, but he chose the socially prominent city of Paris as the best field for his efforts. Under

his leadership dressmaking became an industry of importance, and Paris became a dictator in matters of dress

The short-lived Empire of Louis Napoleon proved to be an instrument for opening foreign markets to Paris-made clothing During the life of the Empire, Paris became the pleasure city of the world Elaborate state functions and other social gatherings brought to Paris many prominent people from other countries, even from across the Atlantic The social functions created a demand for beautiful costumes, and these were supplied largely from the Rue de la Paix When the foreign visitors returned to their homes, their Paris-made costumes created a sensation and laid the basis for the present export of French luxury goods

Art center attracts talent In Paris the creation of fashions thrives in an atmosphere of art The city is famed for its beauty, for the large number of renowned artists living there, and for its art galleries Paris, the art center, therefore attracts talented people who wish training for a career in art This group represents the artistic talent of many countries

Artistic talent may be expressed in various ways, and while many in the art colony are interested in painting, sculpture, or architecture, others turn to costume design, a calling which employs the same sort of talent In fact, one of the most famous of Paris couturiers studied, in his youth, under the great artist Corot The historical museums and art galleries are favorite haunts of people engaged in costume design Many a new fashion is created by studying the costumes of a former age and modifying the historical style to suit the modern taste

Fashion Trade Stimulates Many French Industries. The fashion trade of Paris brings together the work of producers in many sections of France It is, in fact, the means by which products from a large group of industries reach consumers both in France and abroad Paris, situated at the focus of French transportation systems, occupies a location favorable for collecting the output of producers in the various sections of the country (Fig. 260)

Silk industry of Lyon District Because silk is the fabric of fashion *par excellence*, the silk manufacturers of the Lyon District have an intense interest in the dictates of Paris. Lyon and the rural communities tributary to the city make up the leading silk-manufacturing district of Europe Not only does this district produce in vast quantities but

it is unexcelled for the beauty and variety of its specialty fabrics Lyon manufacturers sell to large wholesale merchants and clothing manufacturers both in France and in foreign countries, but Paris is the largest buyer Nearly all the Lyon output goes to Paris, whether the silk is to be worn in France, exported as piece goods, or made into frocks for sale to foreign customers in such fashion-loving centers as New York and London

The market created by the fashion center was opened to Lyon at a critical time in the history of silk manufacture In the 1860's the famous textile art of Lyon seemed almost dead The demand for silk had declined because of the vogue of machine-made fabrics from British mills The newly established clothing industry brought the opportunity which turned the tide of fortune An exquisite piece of silk brocade, its pattern copied from a rare Oriental shawl, was made to order for a leading Paris couturier Its beauty proved that textile skill still existed in Lyon The silk was made into a dress for the empress, who, in her eagerness to encourage French industries, wore it to an important state function Then, royal approval of the fabric having been shown, Lyon silks became the rage Within a few years the number of silk looms operating in the Lyon District had doubled

Textile industries of Northern France Besides silk, the costumers of Paris draw from the looms of the country a long list of materials Woolens, cottons, and linens are supplied in endless variety by French manufacturers in the busy textile area of Northern France The fashion trade gave a new lease of life to this district, as it did to Lyon, at a critical time The change from hand looms to power weaving had been made in the district not long before, and the manufacturers were finding it difficult to get their goods on the market English woolens had a well-established reputation, and well-to-do French people had come to think that they must have imported goods in order to be well-dressed Orders from a prominent Paris couturier for fine goods woven according to special designs changed all this The attention of Parisians turned to the resources of their own country, French woolens became fashionable, and French manufacturers began to specialize in the types of goods which the Paris market called for In response to the requirements of the fashion center, Northern France, like Lyon, specializes in quality goods prized for their beauty, variety, and originality.

The Commercial Role of Paris In its function as the fashion center of the Western world, Paris has influenced profoundly the development of French industry and French commerce By creating a market for articles made in different parts of the country, Paris has made it possible for manufacture in France to prosper in the face of difficulties which forbade competition with the United Kingdom and Germany in the ordinary branches of world trade The most serious of these difficulties is the high cost of coal In contrast to the abundant and widely distributed fuel supplies of Britain and Germany, French coal is scarce and is costly even at the mines

To compensate for the high cost of coal, Paris manufacturers transform their materials into goods of very high value This is accomplished through the art and skill employed. When the goods are sold, they represent the work and artistic talent of many people The British and Germans have built up their vast foreign commerce by utilizing their power resources so as to produce the necessities of life more cheaply than the same articles can be made by hand The French have capitalized the artistic talent of a nation and are selling beauty as well as material

QUESTIONS

Can you apply the facts you have read?

1 What facts can you furnish as evidence that France is characterized by variety (1) of scenery, (2) of climate, (3) of crops, (4) of mineral resources, (5) of exports?

2 The treaties that closed the war of 1914–1918 gave Lorraine to France What influence did this change probably have on the French iron-ore trade? on the rank of France as an iron- and steel-manufacturing country? on the need for maintaining a large army?

3 If it were possible to remove the mountains from southeastern France, making the area level enough for cultivation, what resources, if any, would the country lose with the mountains?

4 A native of Chicago studied art in Europe and gained some success as a painter He now is a prominent *couturier* in Paris Show how his training in art helped fit him for his present work Why, probably, did he choose Paris instead of Chicago for his business?

5 Why do Le Havre cotton brokers not get New York's morning cotton prices until three o'clock in the afternoon?

6 The cotton goods exported from France to the United States in a recent year were valued at five times as much per pound as those shipped to Indo China Why was this so?

7 The commodities imported through Le Havre in a recent year were valued at much more per ton than those received at Rouen Why?

8 Marseille imports more raw silk than any other French port, but wool enters the country chiefly by way of Dunkerque, near the Belgian border In what ways is this a logical arrangement?

9 Vegetable oils and oilseeds form large items in the trade of Marseille Why does Marseille handle large quantities of these commodities?

10 What types of transportation might you choose from if you were going from London to Paris? Why do transportation companies provide frequent services between these points?

EXERCISES

1 *Empires tied politically to Western Europe*

THE FRENCH EMPIRE

Add the French Empire to those shown on the world map which you used in Chapters XXX and XXXI Use orange to show France and the French colonies Add the name to the title of your map You will need the map for one more empire, so keep it for use in Chapter XXXIV

2 *Familiar locations in France*

Prepare an outline map of France either by drawing freehand or by laying a piece of transparent paper over Figure 260 and tracing the outline of the country Then place a legend below your map, including the items listed below Put numbers on your map at the proper points to show the locations In some cases you may need to repeat the same number at two or more points

a Location of views
- (1) Terraced vineyard land (Fig 237),
- (2) River barges engaged in domestic trade (Fig 240),
- (3) Ocean-going vessel engaged in colonial trade (Fig 261),
- (4) A detail of the French coffee trade (Fig 262),
- (5) A famous dressmaking establishment (Fig 263)

b Areas important in French industries or trade
- (6) Ferry ports with services to England (Fig 239),
- (7) Principal French cotton-manufacturing districts (Fig 155),
- (8) Principal French iron and steel districts (Fig 254),
- (9) Principal French coal field (Fig 253),
- (10) Principal French iron-ore field (Fig 253),
- (11) French potash-mining area (Fig 258),
- (12) Principal French rubber-manufacturing center (p 480),
- (13) Principal French center for the manufacture of war materials (p 480),
- (14) French port of largest trade (p 483).

CHAPTER XXXIV

MANUFACTURING IN THE UPLANDS OF WESTERN EUROPE

Contrasted Types of Manufacturing. The hilly and mountainous country of Western Europe presents striking contrasts in industrial development, showing the old and the new side by side In much of the area, manufacturing still is in the handicraft stage, articles being made by practically the same methods as were in use a hundred years ago In contrast, certain districts have developed factory industries that employ the most modern processes The rugged country south of the European Manufacturing Belt therefore supports two contrasted types of manufacturing handwork industries and factory industries

Distribution of Manufacturing Types. The two types of manufacturing differ somewhat in their distribution, though both types are widespread Handwork is a feature of village life in the great upland belt extending from the Atlantic nearly to the Black Sea It appears in valley after valley, wherever people live. The factory industries, in contrast, account for some well-developed manufacturing districts The more important of these districts are grouped about the Alps, and since both their difficulties and their advantages are linked with their location in or near the mountains, we may call them the Alpine Border districts The largest three of the Alpine Border districts are the Swiss District, the Po District of Northern Italy, and the Lyon District of France (Fig. 235)

Handwork Industries. The output of the handicraft industries is surprisingly varied, although in general a single community does not concern itself with more than one or two specialties. Woodcarving, for example, is a well-known Swiss industry, communities in some hilly sections of France do fine work in the tanning of kid skins for gloves, lacemaking is a rural occupation in Spain and Switzerland; some German villages make violins, others weave baskets, and still others make jewelry, and in Italy the weaving of women's hats employs many people These are but a few of the many industries carried on in the homes of peasants The finished articles represent long hours of patient, painstaking labor done during the time that can be spared from farm work, particularly on stormy days and in the long winter evenings (Fig 264).

Wehrli

FIG 264 A group of Swiss girls busily engaged in making exquisite pieces of embroidery

Doll and toy industry—an example The making of dolls and toys is typical of the handwork industries as a whole Though coming in small quantities from many communities, the annual output amounts to millions of dollars The mountain valleys on the southern border of the Saxony District are famous for this work, but the industry extends to many other hilly sections

The history of the industry goes back for several centuries, and some of the villages have been in the business since before the time of Columbus Certain families, through generations of attention to the work, have developed an extraordinary degree of ability They show their ability by originating new kinds or designs of toys as well as by the quality of their work In the early days the output consisted of crudely carved wooden toys made from local materials, and from this small beginning the present varied output has developed The workers now use a long list of materials, including wood, wool, leather, stone, glass, porcelain, celluloid, and rubber.

Relation of handicraft to upland agriculture In the rugged areas of Western Europe the people capitalize the skill of their hands to make up for the poverty of their environment Many of the valleys in the hilly and mountainous sections are crowded with rural communities. The farms are small In many cases they are remote from

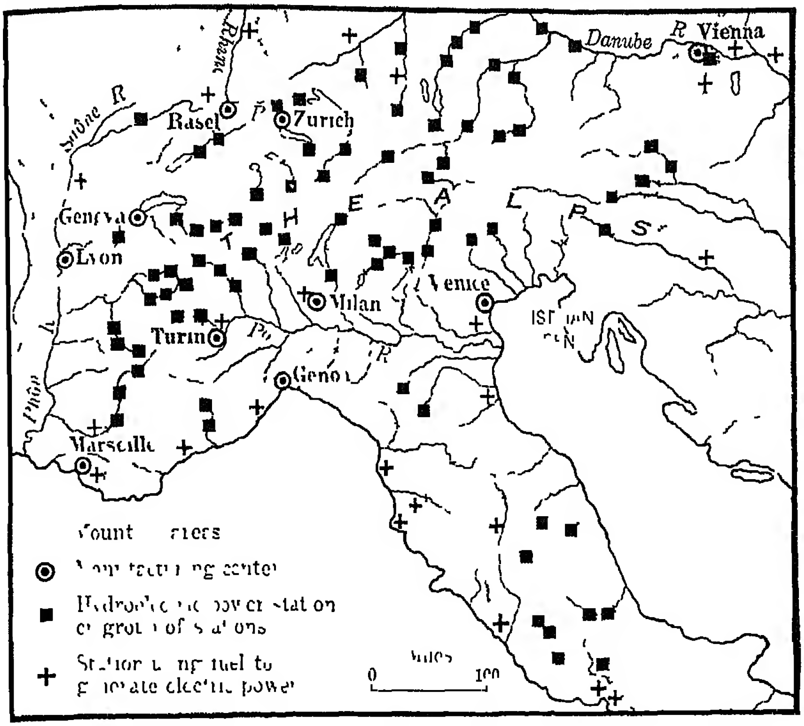

Fig 265 Manufacturing centers, power stations, and streams in the Alpine area Compare with manufacturing districts shown in Figure 235

railways and have no means of communication except over poor roads Into such districts modern ideas and methods have filtered but slowly The fields may yield staple foods in sufficient quantity for the families of the village (Fig 236), but the handwork industries provide a cash income for the purchase of other necessities In many cases the output of the village workers is purchased by tourists who frequent the Alpine vacation land. In other cases it is sold to dealers in the cities of the European Manufacturing Belt.

Factory Industries and Alpine Power. The utilization of water power is making profound changes in the Alpine Border districts (Fig. 265). The peasant families continue to cultivate their fields and to manufacture specialty products for sale. In many communities, however, handwork is giving way to manufacturing by machinery. Four countries control the mountain area with its snow fields, its lakes, and its waterfalls In Italy, Switzerland, France, and

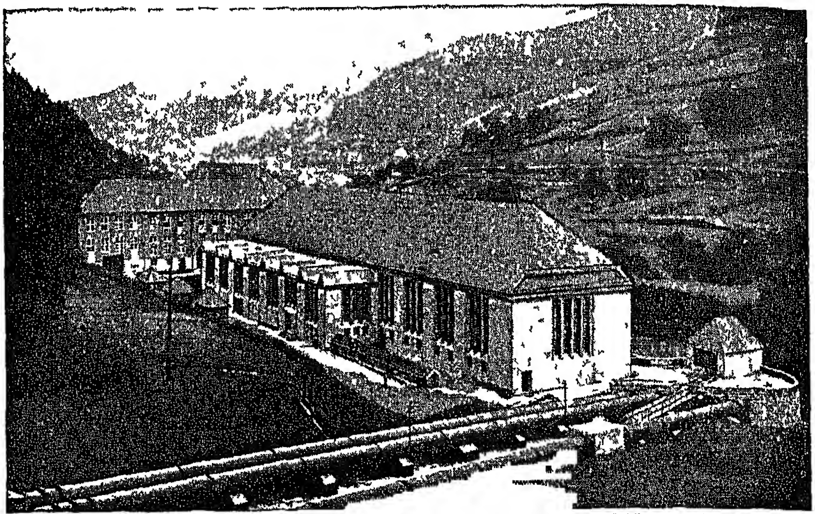

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Fig 266 Power plant in a cultivated valley of South Germany

Germany hydroelectric plants on Alpine streams generate power for manufacturing (Fig 266 and Plate VI)

Value of Alpine power The power of Alpine streams has a high value for three reasons First, there is a large amount of power Precipitation is abundant (Fig 232) The rivers are swift and have many waterfalls Although they carry more water in summer than in winter, these rivers vary less in volume than do many streams; for rain or snow falls on the Alps every month in the year, and the numerous lakes and snow fields form natural storage reservoirs Second, the power occurs in a manufacturing region and near enough to settled districts so that it can be transmitted to the towns and villages for use In the third place, the railway net of Western Europe makes use of Alpine passes and thus provides the transportation facilities which are essential to the success of manufacturing industries (Fig 267).

Industries using Alpine power. Among the industries using the power of Alpine streams, four groups are particularly important The largest and most widespread is the textile group, especially the manufacture of silk and cotton. The industries of the second group manufacture machinery, transportation equipment, cement, and structural steel, principally for local use The third group includes industries which owe their existence chiefly to the presence of local raw materials For example, the mountain forests yield spruce and fir

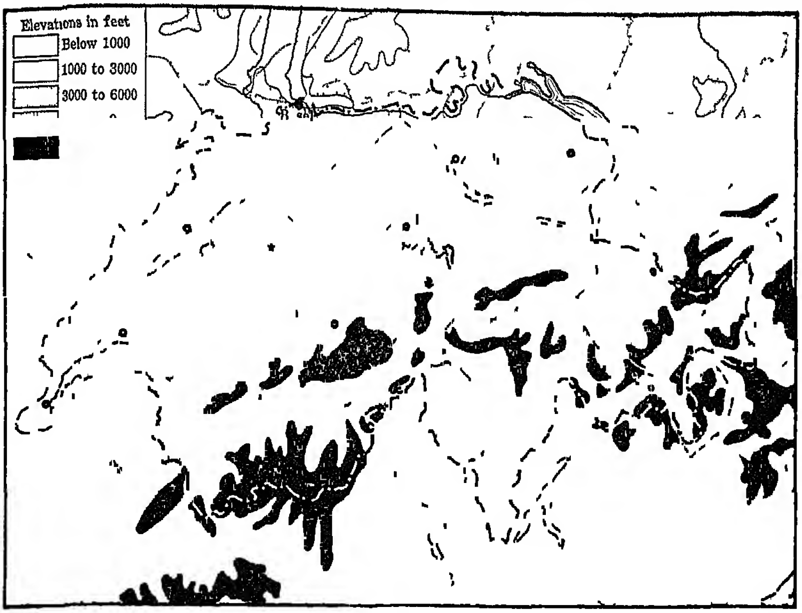

FIG 267 Relief, rivers, lakes, railways, and cities of Switzerland

for the manufacture of fine paper, and products of the Swiss dairies are utilized by the chocolate and condensed-milk industries The industries of the fourth group require large quantities of electricity and have been drawn to the Alpine Border districts for this reason Aluminum manufacture is the outstanding example of this group

Aluminum Manufacture, an Example of Alpine Industry Western Europe manufactures more than half the world's aluminum, and most of the rest is produced in the United States and Canada (Fig 268) Aluminum manufacture is spreading to other parts of the world, however It has become fairly important in Japan, and the Soviet Union ranks among the major producing countries The output of Western Europe comes chiefly from the Alpine Border districts, the plants being situated in France, Switzerland, Germany, and Italy Lesser quantities of aluminum are manufactured in Norway and in Scotland Industries of the European Manufacturing Belt consume most of the aluminum from Alpine plants, but some metal goes to more distant countries

Product of high value One thing that makes aluminum a suitable product for manufacture in the Alpine Border districts is the rela-

tively high value of the metal This makes up, in some degree, for the high cost of transportation in the mountain area Though every clay bank consists largely of aluminum minerals, usable ores are rather scarce Aluminum was not manufactured on a commercial scale until a few decades ago Methods of extracting the metal from the ore have been improved from time to time, but they still are complicated and costly. Consequently, in spite of its abundance, aluminum costs somewhat more than copper and much more than iron

Salable commodity Aluminum-manufacturers find a growing market for their output in spite of the cost Aluminum has qualities that fit it for special purposes, and from time to time new uses are found The world now uses twice as much aluminum as it did in the late 1920's

Aluminum in the form of alloys has become an important structural material Though the pure metal is soft, certain alloys combine great strength with remarkably light weight. This quality makes them valuable for transportation equipment, particularly where speed is an important factor In fact, transportation needs consume nearly half the annual output of aluminum The automobile industry uses less of this metal than it did a few years ago, but the giant airplanes of the present are built mainly of aluminum alloys, and so are the high-speed streamline trains New York's most modern ferryboats contain 35 tons of aluminum apiece, and one big transatlantic liner carries 22 aluminum lifeboats.

Because it does not rust and is not affected by most acids, aluminum serves certain special uses The oil industry employs it in field and refinery. Aluminum tank cars are built for shipping chemicals or gasoline, and aluminum freight cars prove durable for hauling sulphur The brightness of aluminum fits it for use as a lighting reflector The 200-inch mirror of the giant telescope recently installed in Southern California owes its reflecting surface to a thin coating of aluminum, and panels of aluminum foil are built into the dome for the purpose of reflecting the sun's heat and thus protecting the telescope from extreme temperature changes

Aluminum is a good conductor of electricity, hence it can be used instead of copper for electric transmission lines Large quantities are used for this purpose in Western Europe, which lacks abundant resources of copper ores. Even in the United States, with its large copper production, there are several hundred thousand miles of alu-

Aluminum Produced	Metric Tons	Bauxite Mined	Metric Tons
United States	102 000	United States	378 000
Canada	27,000	Surinam	235 000
Germany	99 000	British Guiana	215 000
France	28 000	France	619 000
Switzerland	16 000	Italy	262 000
Italy	16 000	Hungary	329 000
Norway	15,000	Yugoslavia	292,000
Sweden	2 000	Greece	86 000
United Kingdom	16,000	Soviet Union	203 000
Soviet Union	36 000	Netherlands Indies	150 000
Other countries	7,000	Other countries	38,000
World total	364 000	World total	2 835 000

FIG 268 Production of aluminum and sources of aluminum ore in a recent year

minum power lines. For example, the transmission line from Boulder Dam to Los Angeles consists of "A C S R" (aluminum cable steel reinforced)

Near-by supplies of ore Alpine manufacturers get their supplies of bauxite, the claylike ore of aluminum, without an extremely long haul French plants use ore from mines near Marseille. Italian producers get their ore supplies from the Istrian Peninsula, at the head of the Adriatic. German manufactures have the longest haul, for they import bauxite chiefly from mines in western Hungary and from other mines near the Adriatic coast of Yugoslavia

The bauxite itself is not shipped into the mountain area. Instead, manufacturers find it advisable to carry on the first process of manufacture at a place where bauxite, industrial chemicals, and coal can be assembled cheaply. Thus French ore is treated in plants near Marseille, a chemical-manufacturing center to which British coal can be brought cheaply by sea Italian ore is treated chemically at a plant in the industrial port of Venice From these plants the resulting alumina (much less in quantity than the bauxite used) is shipped to Alpine factories

Electricity essential to aluminum manufacture. The final process in extracting aluminum from bauxite requires much electricity. A strong electric current is passed through a fluid containing the prepared alumina and certain other minerals Under the influence of the current, pure aluminum sinks to the bottom of the vat The current needed to produce a pound of aluminum would keep a 40-watt

lamp burning for $12\frac{1}{2}$ days—and aluminum sells for about 20 cents a pound in the United States With the exception of the German plants that use lignite, all aluminum factories, in both Europe and America, are located at valuable power sites Herein lies the advantage of the Alpine Border districts for aluminum manufacture

Supplementary manufacture to use surplus power Irregularity in the supply of power has led aluminum-manufacturers to equip their plants for turning out some additional product In summer, when mountain snows are melting, Alpine streams carry more water and furnish more power than in winter (Fig 269) The plant that manufactures aluminum, however, must be in continuous operation throughout the year if it is to make a profit To make use of the surplus power, departments have been added which run in summer and are idle in winter Some of the industries carried on in these departments are the manufacture of calcium carbide from local limestone, the making of synthetic precious stones, and the preparation of alloys for use in the manufacture of special steels These products are adapted to manufacture where much electricity is available, and the work can be discontinued in seasons of low water without serious disadvantage

The Swiss District. Although Switzerland lies wholly within the Alpine area and has no important deposits of coal or iron, it supports, in the less rugged portions of the country, a dense population largely engaged in manufacturing Its trade, like that of Western Europe as a whole, consists chiefly in the sale of manufactured goods and the purchase of raw materials and foods Its principal manufactured products are textiles, watches and clocks, aluminum, machinery, and such food products as chocolate, cheese, and condensed milk Probably no other mountain-girt country in the world, lacking coal and iron, has advantages which would make a similar development possible

Distribution of manufacturing Manufacturing in Switzerland, as well as agriculture, is related to the distribution of land level enough for cultivation The area most important for both agriculture and manufacturing is the Swiss Plateau, an upland basin in the northwestern section of the country Though far from level, the basin floor has a considerable area smooth enough for cultivation and supports the greater part of the population (Figs 267 and 270) In recent times, hydroelectric power, developed from waterfalls in the mountains, has been brought to the cities and villages of the basin This combination of labor supply and power has encouraged the de

Ewing Galloway N Y

FIG 269 Mountain glaciers that feed Alpine streams On the high Jungfrau range shown in the background, more snow falls in winter than has time to melt in summer Hence the snow fields near the summit of the range are very thick The weight of the snow presses the deeper part of the snow field into ice and slowly forces it into the glacial tongues that creep down the steep slopes nearly to the level of the Alpine pasture in the foreground The presence of drowsy cattle, sunning themselves after grazing, indicates that the picture was taken in summer Sunshine and mild temperature cause rapid melting in the lower parts of the glaciers during summer days, and streams flow down into the deep valley beyond the Swiss cottage

velopment of manufacturing on a factory basis From the plateau numerous valleys extend back into the mountains (Fig 236), and factories have been established in many of these

Advantage of skilled labor Textile manufacture, which contributes the leading item of Swiss export, shows distinctly the Alpine tendency to specialize in high-grade products The output consists largely of high-priced fabrics, such as silks, ribbons, fine cotton goods, and embroidery Workmanship counts for much in these lines, and the amount of raw material is small in proportion to the value of the finished product Swiss textile-manufacturers carefully watch the trend of fashion and the demand for new types or styles of material. They employ experienced designers and an exceptionally well-trained labor force, and their products go to high-grade markets.

The manufacture of watches, centered at Geneva, is another Swiss industry illustrating the same principle In this industry, as well as in the manufacture of fine textiles, the labor and skill employed in manufacture give the finished product its value. The cost of the imported raw material is relatively small

Advantage of transportation facilities In spite of the rugged character of the country, the industries of Switzerland are served by highly developed transportation facilities. This fact is related to the position of Switzerland between highly important sections of Europe Swiss transportation lines, connecting with those of Germany and France on the one hand and with those of Italy on the other, form important links in the transportation systems of Western Europe (Fig 267) Swiss manufacturers therefore have access to excellent transportation facilities for bringing in raw materials and shipping their finished products.

The Lyon District. The area which centers about Lyon, at the junction of the Rhône and Saône, is one of the major manufacturing districts of France (Fig 260) It is known principally for its silk output, but it also manufactures other textiles, chemicals, and iron and steel products In addition it has a host of minor interests, such as paper, millinery, and gloves

The city of Lyon contains some 5000 hand looms and about three fourths of the power-driven silk looms working in France. Hand looms, operated by men in whose families silk-weaving has been practiced for generations, still produce the highest-grade goods of the district—elaborate patterns made in small quantities for special orders Small silk mills are scattered all through southeastern France, but they are particularly numerous in the departments near Lyon There they occupy nearly all the small power sites along the tributaries of the Rhône and Saône.

The Po District and Modern Italy. The lowland drained by the Po and its tributaries forms the largest of the Alpine Border districts, and its industries have much importance for Italy as a nation It contains the largest area of level farm land in the country, while productive valleys extend back into the mountains, it supports about 20 million people, or nearly half the Italian population; and to a large extent its industries are responsible for Italy's place among manufacturing countries. In turn, the industries of the Po District owe their success very largely to the Alps.

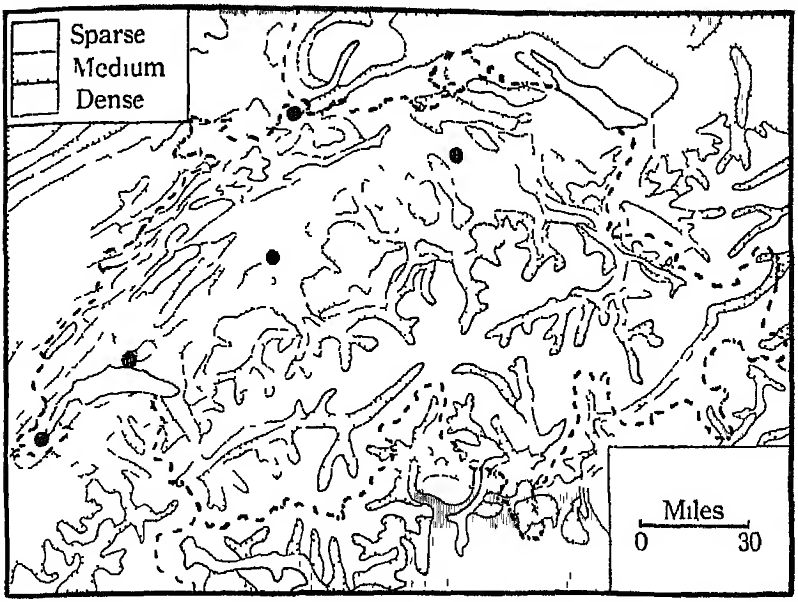

FIG 270 Distribution of population in Switzerland

Principal lines of manufacture The leading branches of manufacture in the Po District resemble those of other districts using Alpine power Textile manufacture ranks first, and the Po District is the principal textile area of Italy. Cotton goods make up the most important group of textile manufactures, but the production of rayon and artificial wool has become a major interest Metal and chemical industries are increasing in importance under government favor; for Italy, like Germany, wishes to cut down the volume of its imports Thus Northern Italy manufactures steel, makes coke in order to get coal-tar products, produces synthetic nitrates, and carries on other lines of industry considered essential to military strength.

Advantages for textile export The cotton-goods output of the Po District, unlike that of Switzerland, includes large quantities of coarse fabrics made for export This fact illustrates certain contrasts between the two areas, both of which have abundant supplies of hydroelectric power and skilled workers The Po District produces for a domestic and colonial market of more than 50 million, in contrast to Switzerland's domestic market of 4 million. Moreover, the cotton mills of Milan, the largest city of the Po District, are less than a hundred miles from the sea, and railways connect Milan with the port of

Genoa by way of low passes Thus a position near the sea, together with access to a large domestic and colonial market, gives Italian cotton-manufacturers a decided advantage over their Swiss neighbors in producing cheap cottons for export

Italy's interest in water power Italy has a third as much developed water power as the United States, and Italian engineers have long been leaders in harnessing streams for work For example, Italy had the first transmission line ever built to carry hydroelectric power to a distant factory, and the machinery for one of the early power plants at Niagara Falls was built in Italian workshops More recently Italian engineers have designed the extremely high dams required in deep and narrow Alpine valleys. They excel in designing machinery to fit peculiar conditions at individual power sites

Italians see in the energy of Alpine streams the hope of regaining the strength and glory of ancient Rome The major political powers of the present are nations which have large populations, which front on busy ocean lanes, and which use the energy stored in their coal deposits to turn the wheels of factories Italy has a large population and fronts on the much-traveled Suez Route, but it lacks coal What wonder, then, that Italians should look longingly toward the lofty snow-capped Alps, which rise abruptly from the densely peopled plain of the Po!

Efforts to make the most of power resources. In trying to obtain the largest possible service from their rivers, the Italians are struggling with problems growing out of irregularities in stream flow Summer rains are heavy in the Alps, and the summer sun causes rapid melting of glacial ice (Figs 233 and 269) Consequently Alpine streams furnish more power in summer than in winter If hydroelectric plants are adapted to summer conditions, they will experience a shortage in winter, and if they are adapted to winter conditions, there will be power going to waste in summer The central and southern parts of Italy, in contrast, get most of their rain in the cooler months, and the rains are so irregular that a shortage is likely to happen at any time.

The difficulties imposed by climate remain as a challenge for the future, but the Italians are doing three things to equalize the supply of power. First, they have constructed or planned more than a hundred reservoirs to store flood waters for the season of scarcity. Second, they have connected the plants in different sections with high-tension

lines, so that in summer the surplus power from Alpine plants can be transmitted to central and southern Italy. In the third place, several hundred steam plants generate electricity to supply the winter shortage of Northern Italy (Fig 265) When streams are high the steam plants generate a relatively small amount of power, but in seasons of low water they use more coal to make up the deficiency.

Significance of Alpine Power—a Conclusion. The Alps provide for Western Europe a wealth of water power, and this resource means much to the countries which occupy the mountain area Water power goes far toward compensating for the lack of coal. Moreover, manufacturing in the Alpine Border districts avoids some of the unfortunate conditions which characterize the coal-using Manufacturing Belt. Hydroelectric power makes the small factory feasible In the Alpine Border districts, therefore, many small textile mills have been built recently in rural villages or market centers. There is a tendency, also, to arrange hours so that the factory workers need not give up their fields and gardens In some cases electric looms have been installed in the homes For a century coal has been drawing people from the farms to crowded cities Hydroelectric power in the Alpine Border districts is carrying manufacturing back to the rural community Here is suggested a hopeful trend of industry, made possible by new skill in utilizing a force of nature.

QUESTIONS

To test your understanding of resources and industries

1 Many small Swiss towns have excellent hotels or inns Why?

2 During what part of the year are the hotels most likely to be crowded? Why?

3 St Moritz, in the Inn Valley of southeastern Switzerland, has many such hotels. Why does this village interest the clothing industry of Paris (pp 487–489)?

4 Why do Alpine mills specialize in fine stationery and cigarette paper rather than heavy paper for wrapping packages?

5 Of what importance to companies that develop Alpine water power are the following (1) the amount of precipitation in the mountain area, (2) the height of the mountains, (3) the comparative amount of precipitation in winter and summer, and (4) the contrast between summer and winter temperatures?

6 What facts serve as evidence to prove that aluminum is a suitable product for manufacture in the Alpine area?

7 Which manufactures the greater amount of aluminum, Western Europe or the United States (Fig 268)?

8 What American country manufactures aluminum but does not mine bauxite? What advantage has that country for the manufacture of aluminum from alumina (pp 400–402)?

9 Why is the port of Venice a logical place for treating Italian bauxite to produce alumina?

10 The United States imports bauxite from South America From what countries does the ore probably come?

11 Why do railways use more aluminum than they did in the 1920's?

12 What are the advantages of having electric transmission lines to connect Italian generating plants in the Alpine area with those in the southern part of the country? Of what metal are the newer electric wires probably made? Why?

13 The northwestern half of Switzerland contains more factories than the southeastern half Why?

14 What relation do Figures 270 and 267 show between population density and elevation? between population density and railways?

15 The railroad that runs up the Rhône Valley from Geneva (Fig 267) crosses the boundary between Switzerland and Italy by means of a tunnel Why? (See also page 24)

16 From what part of France do Lyon factories get raw silk? Through what port do they probably import Italian and Chinese raw silk?

EXERCISES

1 *World sources of bauxite* (*Fig* 268)

Prepare a multiple-unit graph to show the relative amount of bauxite mined in the principal producing countries Let one car, with load heaped above the side, stand for 100,000 metric tons of ore, and indicate a remainder less than 100,000 tons by an extra car whose load does not show The number of cars needed for the French output will determine how big you can draw the cars and get the required number in one line Do not forget that every graph should have a title and legend

France 

2 *Landscape study in the Alps*

Study Figure 269 to find answers to the following questions (1) Where was the picture taken? (2) At what time of year was it taken? How do you know? (3) What Swiss industry is suggested by the foreground of the picture? What export product may be prepared in the cottage? (4) What is the purpose of the enclosed space shown at the right of the cottage? (5) Of what material is the fence built? (6) Where, probably, was this material obtained? (7) Why is the cottage not occupied during the whole year? (8) How can you tell from the picture that the mountain in the background rises to a high elevation? (9) What evidence is there that the range gets heavy precipitation? (10) In what part of the picture are mountain glaciers shown? (11) Do the glaciers ever disappear during summer? (12) What interest do the glaciers hold for hotelkeepers? for power companies? (13) Is it probable that the valley beyond the cottage contains power plants? Why?

3 *Empires tied politically to Western Europe*

THE ITALIAN EMPIRE

Add this title to the map which you started for Exercise 1, Chapter XXX Then color Italy and the Italian Empire yellow Study your map to find answers to these questions

a Which country has the largest empire?

b What continent consists almost wholly of colonies? Which is wholly within one empire?

c In what parts of Asia are most of the European colonies?

d What American countries belong to European empires?

CHAPTER XXXV

FEEDING AN INDUSTRIAL AND COMMERCIAL POPULATION

Because of its large city population, the European Manufacturing Belt is the greatest market for foodstuffs in the world Nearly 20 million people live in London, Paris, Berlin, and Vienna, and 25 millions live in other large cities of this densely peopled belt To these cities and to others of lesser size, foodstuffs move from near-by farms, from more distant parts of the Continent, and from oversea regions

	Amount Consumed	Per Cent Imported
Wheat	6 853 000 tons	79
Meats	2 735 000 tons	59
Potatoes	5,467 000 tons	6
Eggs	7 035,000,000	37

FIG 271 Britain's dependence on other countries for selected foods in a typical year Note contrast between imports of wheat and of potatoes

Staple Crops Widely Grown in Western Europe. The farms of Western Europe produce a surprisingly large proportion of the staple foods consumed by the dense population of the region Dependence on other regions varies with the class of food For example, Western Europe produces nearly its whole requirement of bulky foods such as potatoes, and of readily perishable commodities such as fresh milk (Fig 271). Home production of wheat and meats, on the other hand, falls far below the needs of the region, but even in the densely peopled Manufacturing Belt a considerable amount of land is devoted to bread grains, root crops, and pasture (Figs 272, 273, 274, and 275).

Principal Wheat-Growing Areas. Wheat culture in Western Europe extends from the Mediterranean to southern Sweden Eastern England, Central Germany, France, and Italy are famous for their big crops Much of the cultivated land in Spain is devoted to wheat, but there the yield varies greatly from year to year because of the undependable rainfall. The French wheat crop usually exceeds that of either Canada or Argentina and nearly satisfies the country's needs. In Britain, with a larger population and a smaller area of good farm land, home-grown wheat ordinarily makes up about a fifth of the

supply. Even Italy, with its small area and its scarcity of level land, produces more wheat than does Australia

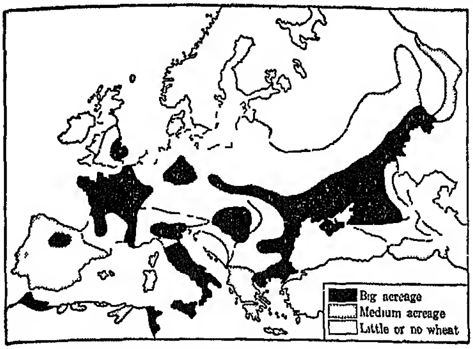

FIG 272 Where wheat is grown in Europe

Wheat grown under intensive methods How can the farmers of Western Europe, paying high rent and employing much labor for farm work, grow wheat in competition with farmers in the United States, Canada, Argentina, and Australia? To be sure, the various countries of Western Europe collect import duties on all wheat brought from foreign lands, but, even so, the farmers must manage their business skillfully and use effective farming methods if they are to make a profit They sow wheat only on land well suited to it, carefully remove the weeds from between the rows, and follow scientifically planned rotations By such methods they secure a higher yield than their oversea competitors. Furthermore, their wheat goes to near-by mills, whereas oversea wheat pays freight charges for a long haul

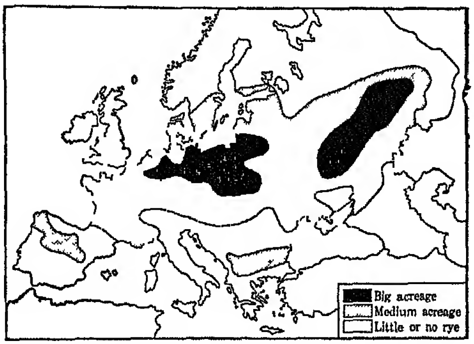

FIG 273 Where rye is grown in Europe

Rotation practices without corn The rotations practiced by wheat farmers in Western Europe differ from those of the American Corn Belt, although they are based on the same principles (pp. 250–251) Corn would not ripen in the relatively cool and somewhat cloudy summers of Western Europe north of the Alps. Hence some root crop takes the place of corn, providing stock feed and enabling the farmer to improve the condition of his soil by frequent tillage. In Northern France and Central Germany sugar beets form the cultivated crop of the rotation In Eastern England the farmers generally grow turnips or forage beets in rotation with wheat, but they also de-

vote some land to sugar beets The Po Lowland of Northern Italy has summers hot and sunny enough so that corn as well as wheat is grown.

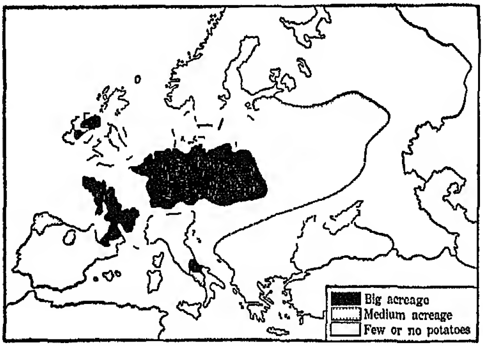

Fig 274. Where potatoes are grown in Europe

Agriculture in Eastern England. Conditions in the wheat-growing section of Eastern England illustrate the highly developed agriculture which characterizes Western Europe. In that section of England a farmer from the American Corn Belt would find much to remind him of home, but he would find striking contrasts as well. The land has a similar gently rolling surface, and a typical farm contains about 100 acres. Wheat, barley, and clover occupy much of the cultivated land, but there are no fields of waving corn The farm is likely to have several fields devoted to brussels sprouts or some other vegetable crop grown under contract for London dealers.

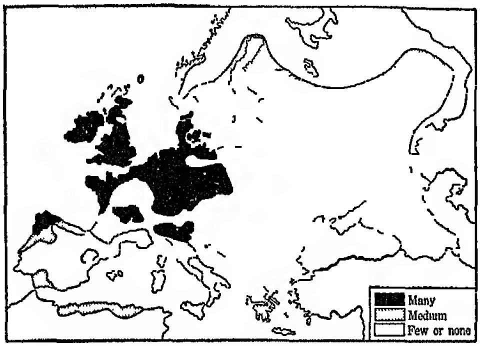

Fig 275 Cattle in Europe

The stone houses and hawthorn hedges give the landscape quite a different appearance from that of the Corn Belt The farmstead ordinarily contains several residences; for a hundred-acre farm in Eastern England requires the work of four or five men throughout the year, and the landlord provides houses for these men and their families Commonly, the farm buildings cluster about the village, which forms the social center for a group of farms and which contains a general store, the church, the village school, and the house of the landlord (Fig. 276).

Eastern England has a function in the livestock industries resembling that of the American Corn Belt. Farmers in this section buy sheep and cattle bred in Ireland or in the rough upland areas of the

FIG 276 Farmstead of an English squire

Pennines (Fig 277) and fatten them for market Early in the autumn the sheep are turned into a turnip field to pasture, being fed oil cake at the same time They are ready for slaughter in late autumn Feeder cattle graze on rich clover pastures and also are fed oil cake Whenever a few animals are ready for slaughter, the farmer takes them to a near-by village on market day (Fig 278) He need not ship the fat stock by rail, for he lives within the great market area.

Beef and mutton brought by refrigerator boats from Argentina, Australia, and New Zealand compete with the product of English farms, but the English farmer has the advantage of nearness to market. This advantage affects the price which he receives as well as the cost of sending his stock to market British consumers prefer fresh meat of the excellent quality produced at home, and they are willing to pay good prices for it

Utilizing Sandy Soil in Northern Germany. Much of northeastern Germany has a sandy forest soil unsuited to the culture of wheat and sugar beets In many countries such soil would be left untilled; but on the borders of the European Manufacturing Belt even poor soil is worth cultivating

Northern Germany belongs to the rye-growing belt of Europe. This belt lies somewhat farther north than the best wheat-growing

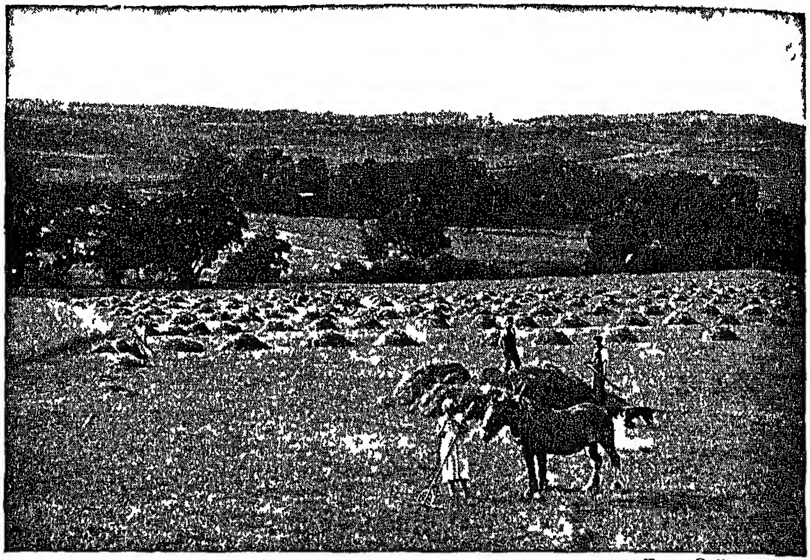

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Fig 277 Haying on upland moors back of the Newcastle District, England The English upland areas are valuable livestock country and produce fine crops of hay, though they are too cool in summer to be good grainlands The hay field shown in the view is not at a very high elevation, for the highest peak that shows in the distance is only 1016 feet above sea level, but the area lies in the latitude of southern Alaska

areas (Figs 272 and 273). Rye is grown in rotation with potatoes. The German potato crop resembles the American corn crop in that a large part of the crop is used on the farms for feeding pigs The two crops are similar also in giving a large yield per acre. Sandy soil, cool and humid summers, and generous rations of potash fertilizer make the potato a particularly successful crop, and it is a valuable member of the crop combination. The use of alcohol for motor fuel gives the potato still further value (pp 474–475) Germany and Poland raise more than half the European potato crop

European Horticulture. Farmers in Western Europe, having the advantage of large near-by markets, give much attention to horticultural crops In the vicinity of Paris, Berlin, London, and other large cities, the interests of the rural communities center about market gardens and poultry rather than about cereals and livestock In addition, special horticultural districts have developed where conditions of climate, soil, or slope are particularly favorable

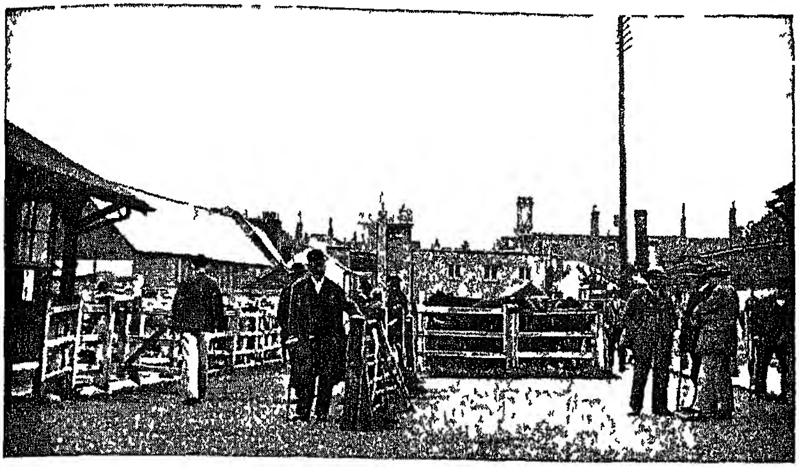


FIG 278 A September market day in Hitchin, a rural village about fifty miles north of London There are a number of market towns within ten or fifteen miles of Hitchin, holding market on different days of the week Hitchin's market day is Tuesday

Orchards and vineyards north of the Alps Fruit trees in Europe, as in the United States, are more numerous in the hilly sections than on the level wheat lands The hilly belt north of the Alps, with its humid summers and its frosty winters (Fig 233), produces orchard crops, such as apples and cherries Vineyards thrive as far north as Central France, while in Switzerland, Northern France, and the Rhine Valley they occupy favored sites on sunny slopes England and the Netherlands, in the same latitude as British Columbia, produce a few grapes in greenhouses for city markets.

Dutch gardens. The Netherlands, with its delta soil and its position in the European Manufacturing Belt, is characterized by agriculture resembling that of suburban areas Farms are small and are famous for their horticultural and dairy products Potatoes occupy a large acreage, and much attention is given to the cultivation of fresh vegetables, flowers, and fruits The output of the farms is largely for export, going to German and Belgian cities of the International Triangle and to London Rapid ferry services across the North Sea make it possible for Dutch vegetables and flowers to be placed on sale in London the next morning after they are gathered. The position of the Netherlands is so valuable that it justifies the vast sums spent by the Dutch in reclaiming wet and flooded lands.

Month	Total Imports	Germany and the Netherlands	France	Channel Islands	Spain	Canary Islands
	Tons	Tons	Tons	Tons	Tons	Tons
January	14 000	8 000	2,000	—	—	—
February	13 000	7 000	2 000	—	—	—
March	19 000	8 000	3,000	—	—	1 000
April	40 000	17 000	5 000	—	4,000	4 000
May	72 000	16 000	12,000	5 000	28 000	4 000
June	147 000	5 000	83 000	42 000	8,000	2 000
July	58,000	11,000	35,000	11 000	1,000	—
August	15 000	8,000	5 000	1 000	—	—
September	5 000	4 000	8,000	1 000	—	—
October	7 000	4 000	2,000	—	—	—
November	13 000	8 000	2,000	—	—	—
December	9 000	4 000	2 000	—	—	—

Fig 279 Where Britain buys potatoes

Specialty areas and Britain's potato supply The British potato trade illustrates the importance of seasons in marketing horticultural products British potato imports are largest in spring and early summer (Fig 279) During the eight months from August to March the home-grown crop furnishes most of the supply, but some potatoes are received each month from neighboring areas on the Continent Beginning with November, small quantities of new potatoes from the Canary Islands enter London, selling at luxury prices. Imports from that source reach their maximum in April Sometime in March a few shipments arrive from lowlands on the Mediterranean coast of Spain, and by May, Spain has become the largest source of British imports Spanish farmers buy Scottish potatoes for seed and plant them in January The prices obtained for the early Spanish crop lead the Scottish farmers to say, "We ship potatoes to Spain and a few months later they come back wrapped in tissue paper."

Distance as well as seasonal temperature has a bearing on the potato trade When the Spanish crop begins moving, Canary Island potatoes soon disappear from British markets. Spanish potatoes, in turn, give way in June or July to the crop grown on the Brittany coast and the Channel Islands A little later the earliest of the English-grown crop appears, beginning with shipments from certain sandy coastal strips in western and southwestern England Thus each district is forced out of the trade as soon as the crop of a nearer district

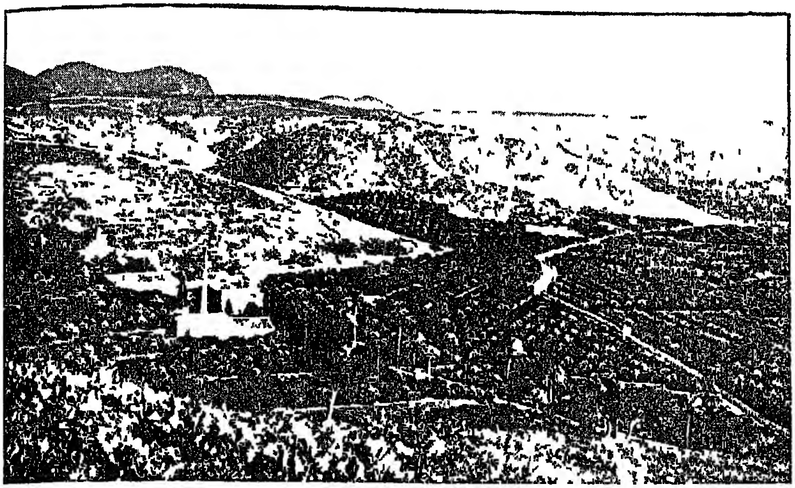


FIG 280 Citrus groves on piedmont alluvial plain near Valencia, Spain Electrically driven pumps lift ground water from wells to irrigate the groves Palm trees typically appear in the landscape with the citrus groves of eastern Spain, just as willows are typical of the rice-growing areas

appears on the market The importance of distance is particularly great in the case of a bulky commodity, but the Manufacturing Belt draws other horticultural products from different areas according to the season

Mediterranean horticulture The Mediterranean Border of Western Europe resembles California in that it produces citrus fruits, early fruits and vegetables, and dried fruits for shipment to market areas with frosty winters (pp 202–203) In addition, this area, together with Mediterranean Africa, makes up the world's greatest olive-growing area The citrus fruits and garden vegetables come from irrigated lowland areas, but most of the olive groves and vineyards are managed under dry-farming methods on unirrigated land.

Many of the citrus groves in Mediterranean Europe, as in California, occupy piedmont alluvial plains (Fig. 280) at the foot of mountains Irrigation water is obtained chiefly from wells The principal orange-growing districts of the Western Mediterranean are near Valencia in Spain and near Naples in Italy, while Sicily ranks first in lemon production (Fig 281) Recently another Mediterranean area —Palestine—has become an important competitor in the citrus trade; and two Southern Hemisphere countries—Brazil and the Union of

South Africa—export large quantities during the northern summer Mediterranean citrus-growers, unlike those of California, sell most of their crops in foreign markets and thus face the hazards of import duties and trade restrictions

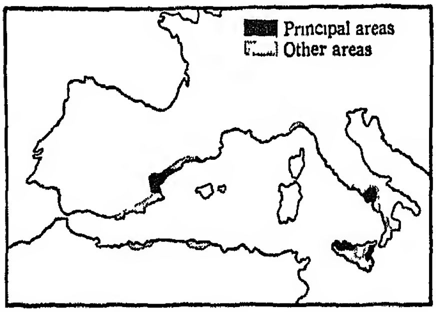


Fig 281 Where citrus fruits are grown in Europe

Throughout much of the Mediterranean Region, grapes and olives are grown in the same locality—in fact, many fields produce both But the vine can stand colder winter weather than the olive tree; hence vineyards extend farther north than olive groves (Figs. 282 and 283) Both the olive tree and the Mediterranean grapevine have deep root systems and live through the dry summers without irrigation, but vineyards producing table grapes are provided with irrigation. The largest and most widespread use of the Mediterranean grape crop is wine-making The Málaga district of southern Spain is famous for its raisins and once produced nearly all the raisins of commerce It has found serious difficulties in recent years, since California supplies the American market and Britain has placed an import duty on raisins to favor the Australian crop

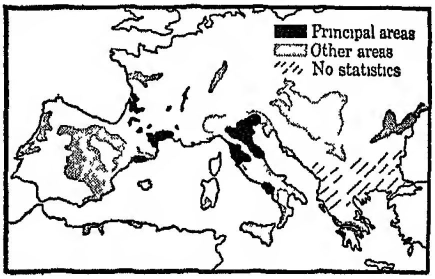


Fig 282 Where grapes are grown in Europe

Denmark, a Nation of Dairy Farmers. Cattle-raising long has been important in Western Europe north of the Alps (Fig 275). This branch of agriculture has been stimulated by the demand for dairy products and for meat, while the moist and relatively cool summers favor the growth of pasture and fodder crops Attention to dairying has increased with the development of the Manufacturing Belt and the growth of city markets. The change is illustrated by the development of the Danish dairy industry. The change there is more conspicuous than in many places, because in Denmark it concerns a whole nation

Dairying stands first among the industries of Denmark Butter, bacon, and eggs account for about two thirds of the value of Danish exports Two of these commodities may be considered as by-products of the dairy industry, since skimmed milk is fed to pigs and poultry Danish exports go chiefly to the European Manufacturing Belt, the United Kingdom being the principal customer Denmark ordinarily supplies about half the bacon and nearly a fourth of the butter imported into the United Kingdom

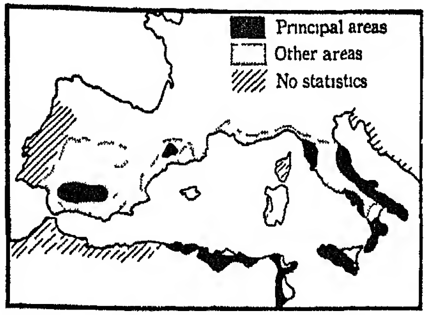


Fig 283 Where olives are grown in Europe

The dairy industry has been responsible for a considerable degree of prosperity among Danish farmers. This fact might be guessed by a visitor from the appearance of the rural landscape, with its tidy villages, its sleek cows tethered in clover pastures, and its well-kept roads (Fig 284) The success of the dairy industry makes farming a popular calling in Denmark, and the population of the rural districts has increased within the last few decades

How the Danish dairy industry originated The beginning of dairy farming in Denmark illustrates the fact that the success of an industry may be affected by events in other countries Changes in the Commercial World brought hard times to Denmark in the 1880's For some years previously Danish farmers had made fair profits by selling wheat and other cereals The rapidly growing cities of Britain demanded ever-increasing quantities of foreign grain. Danish farmers had the advantage of nearness to the British market, and the high prices obtained brought them prosperity Land values were increasing, and ambitious farmers borrowed money to improve their farm buildings Then came the crash Grain prices fell to about two thirds of their former level, and farmers could not pay their debts

What had happened? American farmers had moved beyond the Appalachians and occupied the rich agricultural lands of the Corn and Spring Wheat belts Working large tracts of virgin land with machinery, they produced enormous crops of wheat Railways had been built to connect the new wheat lands with the seaboard, and

James Sawders

Fig 284 Pasture scene in Denmark

steamship services had been established on the Atlantic Huge quantities of cheap wheat poured into Britain, and wheat culture in Denmark became unprofitable Out of this sad misfortune the Danish farmers slowly built up their present prosperity by turning their attention to dairy farming

Why the dairy industry succeeded One reason for the success of the Danish dairy industry is that by specializing in a somewhat perishable product the Danes were able again to capitalize their advantage of position In British cities the demand for butter was increasing, as well as the demand for wheat Oversea producers could not enter the butter trade, for refrigeration had not been established on ocean steamships at that time, and transportation was slower than at present Denmark was one of the few countries near enough to have their butter reach England in good condition

A second reason for success is that the new branch of agriculture is better adapted to the Danish climate than is cereal culture Long-continued drizzly rains are frequent, and from ninety to a hundred days in the year are foggy Even Copenhagen, situated on the sunnier side of the land, has only about fifty days of sunshine in the year. In the cool and cloudy summers grain does not ripen well, and the damp weather hinders the work of harvest The climate, however, is ideal for grass, and pastures are rich, even in late summer The winters are mild, and by scientific management the Danish farmers obtain a regular supply of milk from their herds throughout the year

Moreover, the cool summer weather favors the care of the milk and the production of butter with a good flavor.

A third reason for their success is that the Danish farmers earnestly studied the problems of manufacturing and marketing a high-grade product The change from cereal culture to dairy farming required a period of years The farmers organized co-operative associations, which did much pioneer work in devising scientific methods of butter-making The co-operative associations insist upon proper care of the milk, they employ expert butter-makers, and their trade-marks stand for uniformly high quality Success is due therefore to both natural advantages and well-directed effort.

Food from the Sea. Western Europe draws large quantities of food from the shallow seas adjacent to the region. These seas lie upon the continental shelf, and the water above the "banks" is the home of many varieties of fish (such as the cod, sole, and halibut) which feed upon mollusks and other small animals living at the bottom of the shallow water Other varieties, including the herring and the mackerel, visit certain shallow-water areas during the spawning season to deposit their eggs

Taking advantage of the abundant supply of fish and of the vast market for foodstuffs in Western Europe, a great fishing industry has developed The fishing fleets include boats from all the countries having coastal positions, but Britain, entirely surrounded by shallow seas, boasts the most numerous fleet and the largest catch Some of the boats depend upon fish that swim near the surface, while others draw their catch from the sea bottom

Near-surface fishing and the cured-fish trade. The herring forms the principal catch of the boats which spread their nets near the surface At certain seasons the herring visit their spawning grounds in the North Sea, the shallows along the Norwegian coast, and other near-by waters They swim in schools near the surface, and hundreds of boats, commonly of small size and manned by small crews, fish for them with drift nets These nets hang in the water all night like a great curtain, and if a school of herring finds the net in its pathway the fish are caught by their gills in the small mesh.

Most of the herring catch is sold to fish-curing plants to be cleaned and either packed in brine or smoked Thus near-surface fishing supplies the cured-fish trade, providing relatively little fresh fish Herring fishing is active along the British coast, and much herring cured in

British ports is exported to Germany, Poland, the Baltic States, and other countries on the Continent in times of peace.

Sea-bottom fishing and the fresh-fish trade. Bottom feeders include many of the salt-water fish valued for the fresh-fish trade. The fleets of Western Europe fish for these varieties in the North Sea and adjoining waters, but they also visit shallow-water areas as far away as the White Sea and Iceland. Boats engaged in this branch of fishing carry enough men to clean and pack the fish in ice, and they are equipped, in many cases, for voyages lasting three or four weeks

Where the banks have a relatively smooth surface, bottom feeders commonly are caught in seines or in nets shaped like great open-mouthed bags, which are dragged along the sea bottom Where the sea bottom is irregular and rocky, as on the cod-fishing banks near the coast of Norway, they are caught with long lines having baited hooks attached at intervals From the numerous fishing ports of Western Europe the greater part of the catch of bottom feeders goes to wholesale fish markets which supply retail dealers in the surrounding territory

QUESTIONS

1 Which has the larger number of livestock, Western Europe or the United States (pp 415–416)?

2 Which probably has the largest proportion of its area planted to crops, the Alps, the Mediterranean border, or the area between the Alps and the North and Baltic seas (Fig 230)? Why?

3 Which of these divisions probably has the largest proportion of its farm land supplied with irrigation (Fig 233)? Why?

4 Which division has summers long enough and hot enough for corn (Figs 128 and 233)?

5 What part of Western Europe most nearly resembles Southern California in temperature (Figs 116 and 233)?

6 Which produces more wheat, Western Europe or Canada?

7 In addition to its four great metropolitan centers (p 510), there are in the European Manufacturing Belt 50 cities with populations of more than 200,000 each What bearing has this fact on the nature of imports into countries of the Manufacturing Belt?

8 Britain has either 22 or 7 of the 50 cities of more than 200,000 Which number seems the more reasonable? Give facts to support your opinion

9 Rye gives a fair yield on coarse-textured forest soils not suitable for wheat Of what importance is this fact to farmers in Germany?

10 The Canary Islands are in the same latitude as southern Louisiana What bearing has this fact on their potato industry? What bearing has location on this industry?

11 Nearly all the fresh milk imported into the United Kingdom is obtained from Eire What manufacturing district probably imports most milk from Eire?

12 Why is it wise for farmers north of the Alps to keep much of their land in hay and pasture crops?

13 Is dairying more important in the Mediterranean border or in the area north of the Alps? Why?

14 At one time Denmark furnished nearly all the butter imported into the United Kingdom, but Britain now gets much more from Australia and New Zealand than from Denmark What changes have made this possible?

15 During which months are shipments from Australia probably greater, June to August or December to February? Explain

16 In what way does the agriculture of Eastern England resemble that of the American Corn Belt? How does it differ?

EXERCISES

1 *Agriculture and food supply in Western Europe*

Investigate some important conditions of agriculture in the European Manufacturing Belt by means of the following questions (1) What part of the food supply is suggested by Figure 278? (2) Is this food produced mainly for domestic use or for export to neighboring countries? (3) Farmer N— (in the center foreground, looking towards the camera) raises wheat, oats, barley, and sugar beets, and he also keeps much of his land in clover and other hay and pasture crops How does this crop combination compare with that of farmers in the American Corn Belt? (4) Why is it wise for Farmer N— to have much hay and pasture land on his farm? Do farmers near Paris probably follow this practice? Why? (5) What business probably brings Farmer N— to the Hitchin market? (6) Of what advantage is it to him that markets in the various towns and villages are open on different days? (7) What relation probably exists between the business of Farmer N— and the area shown in Figure 249? (8) Fruit stalls of the Hitchin market offer for sale oranges imported from the area shown in Figure 280 or similar areas in the same section of Spain Why is this fruit not grown near Hitchin?

2 *Britain's dependence on imported foods*

Prepare an outline for a talk on Britain's large use of imported foods, making use of information gained from Chapter XXXV and other chapters studied, particularly Chapters XXIX and XXX Consider the following points (1) variety of foods imported (Fig 246), (2) variety of sources for imports of fruits and

vegetables (Fig 245), (3) reasons why Britain produces nearly all its fresh milk supply but imports large quantities of butter and cheese, (4) reasons why most of the potato supply is home-grown (Fig 271), while more than two thirds of the wheat supply is imported, (5) time of year when potato imports are largest (Fig 279), and reason for this, (6) area from which come the earliest imports of new potatoes, (7) principal source of new potatoes in May and reason for the shift in source, (8) principal source in June and reason for change, (9) reason for big drop in potato imports between June and August, (10) reasons why nearly half the meat supply is produced at home

3 *Citrus groves of Mediterranean lands*

Make a study of citrus culture in Mediterranean lands by means of the following questions (1) What name is applied to the land on which the groves shown in Figure 280 are planted (pp 210–211)? (2) Where, probably, did the material of the plain come from? (3) Do the groves need more irrigation water in winter or in summer (Fig 233)? (4) Where do the growers get irrigation water? How does this practice compare with that of citrus-growers in the Los Angeles District? (5) Do the groves shown in Figure 280 consist chiefly of orange trees or lemon trees? Why do you think so? (6) Does the fruit from the groves in Figure 280 go chiefly to domestic consumers or to foreign markets? (7) What other Mediterranean areas compete with eastern Spain in selling oranges north of the Alps (Fig 281 and p 517)? (8) What competing areas are there in other parts of the world?

5

COUNTRIES OF NORTHERN EURASIA

CHAPTER XXXVI

EASTERN EUROPE AND SOVIET ASIA

1. *Beyond Western Europe*

Interior of World's Largest Land Mass. Beyond the manufacturing and commercial region of Western Europe, an area three times as large as the United States stretches across Eurasia to the Pacific. The western border of the area contains seven countries Finland, the three Baltic States (Estonia, Latvia, and Lithuania), Poland, Hungary, and Rumania The rest, amounting to more than 90 per cent of the area, belongs to the Soviet Union (Union of Soviet Socialist Republics), which lies partly in Europe and partly in Asia (Plates V and VII). Though the vast area of Eastern Europe and Soviet Asia touches three coasts, it is remote from the great ocean highways.

Settled and Unsettled Regions. Eastern Europe and Soviet Asia together support nearly 250 million people, and yet there are great empty spaces where mankind finds little opportunity for making a living (Fig 285) Most of the people live in the great central plain of Eurasia, which extends from the Black and Caspian seas to the Baltic and Arctic shores and the Yenisei River East of the Yenisei is a great forested upland crossed by mountain ranges European settlers have moved into the southern part of the upland, particularly along the route of the trans-Siberian railroad, but in general the upland is an unsettled and little-known region

Sparsely settled North North of the latitude of Leningrad (60 degrees), the great central plain of Eurasia is a sparsely settled area (Figs 286 and 287) Forests of pine and other coniferous trees extend across Finland and the basins of Arctic-flowing streams in the Soviet Union A few small settlements are dotted along the streams, but this northerly zone offers little opportunity for agriculture It has forest soils of poor quality—poor in both lime and humus, and the summers are too short and too cool for most grain crops (Fig 288)

Long-settled belt of mixed forests South of the latitude of Leningrad, broad-leaved deciduous trees appear among the evergreens, increasing in numbers toward the south. This belt has longer and somewhat warmer summers than the coniferous-forest area, and the soils have more humus because of the annual leaf fall. The zone of mixed forests covers southern Finland, the Baltic States, and north

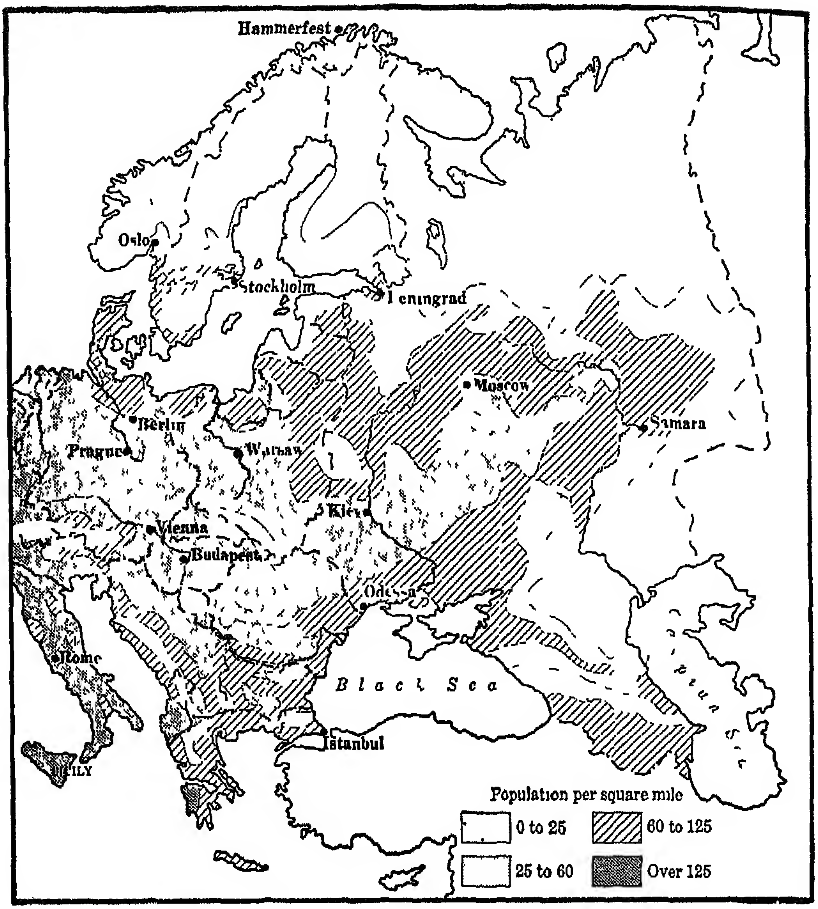


Fig 285 Population density of Eastern Europe

ern Poland and extends eastward to Soviet Asia It is a long-settled area, with a population of moderate to high density

Densely peopled grassland belt. The southern part of Eastern Europe is an area of grassland soils with a dense population and a long-standing reputation for wheat production (Figs. 285 and 272). It extends across the basins of the Danube and the south-flowing rivers of Soviet Europe, and thus it includes parts of several countries. The Danube plains are divided into two parts by the Carpathian Mountains The Plain of the Middle Danube, inside the curve of the Carpathians, is divided among Hungary, Rumania, and Yugoslavia.

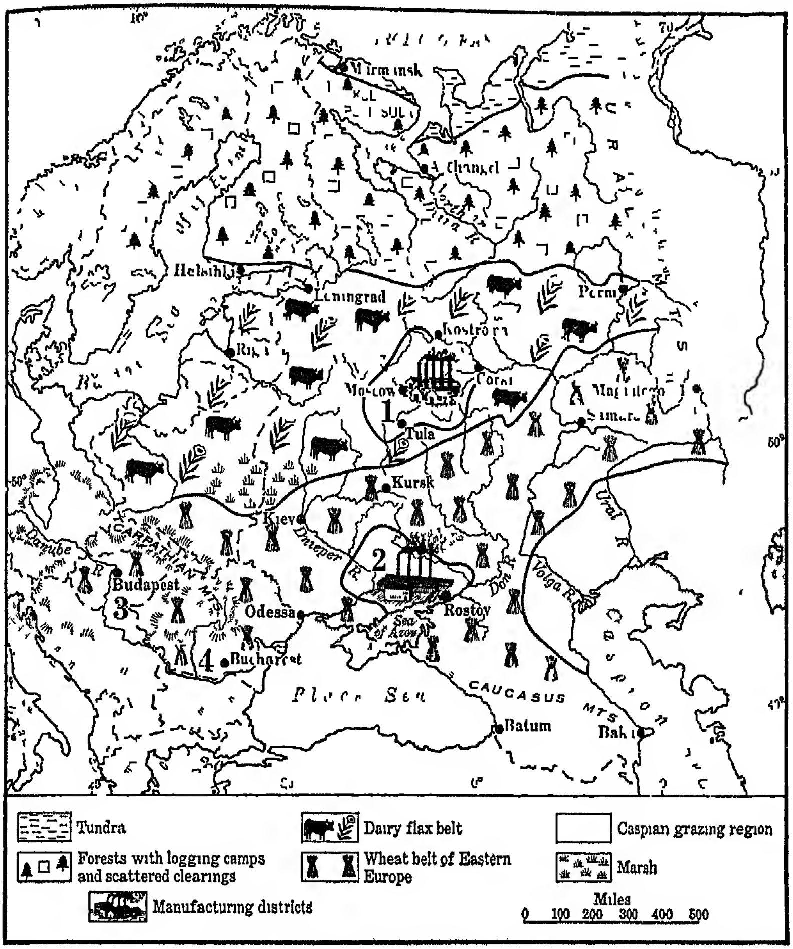


FIG 286 Contrasted divisions of Eastern Europe Numbers indicate 1, Moscow District, 2, South Ukraine District, 3, Plain of Middle Danube (Hungarian Plain), 4, Plain of Lower Danube

The Plain of the Lower Danube, between the Carpathians and the Black Sea, lies wholly in Rumania. It is continuous with the Black Soil Region, the wheat-growing grassland area of Soviet Europe

Commerce of Eastern Europe and Soviet Asia. The countries of Eastern Europe and Soviet Asia sell the products of basic industries (Fig 5) and buy the products of manufacturing industries Their major exports fall into the following groups (1) lumber, wood

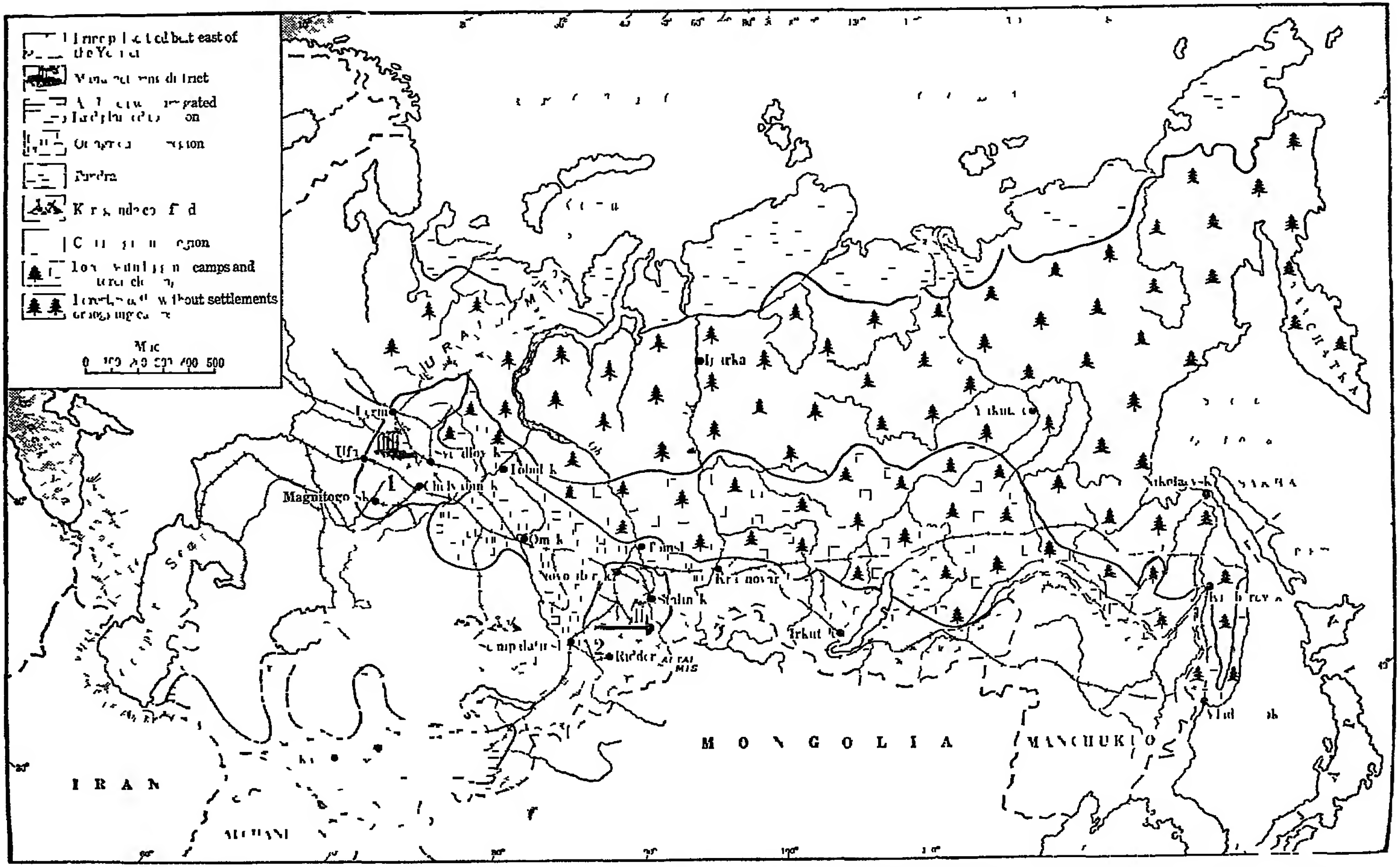


Fig 287 Contrasted divisions of Soviet Asia Numbers indicate location of manufacturing districts · 1, Ural District 2, Altai District

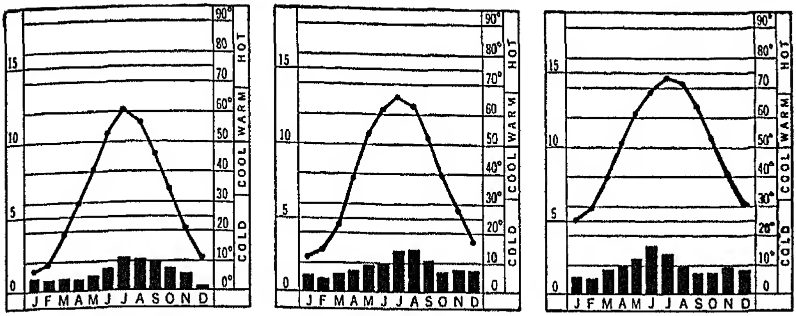


FIG 288 Temperature and precipitation in three contrasted areas of Eastern Europe Archangel, in the Forest Belt of Northern Eurasia, Moscow, in the Dairy-Flax Belt, and Bucharest, Rumania, in the Wheat Belt of Eastern Europe

pulp, and paper, (2) mineral fuels and ores, (3) livestock, dairy, and poultry products, and (4) grains, particularly wheat In addition, they ship fur skins, fish and caviar, flax fiber, hand-woven linens, and Oriental rugs Their imports consist largely of such factory products as iron and steel, machinery and automobiles, and textile manufactures But they also import raw cotton and wool and special food products—fruits, rice, tea, and coffee, for example

Trade with regions east and west The countries of Eastern Europe trade principally with their manufacturing neighbors on the west, especially Britain and Germany, selling foods and raw materials, and buying factory products. Their dealings with the United States are relatively small, but they find in this country a market for some wood pulp and fur skins, and they buy American raw cotton, machinery, and automobiles. Soviet Asia buys and sells mainly in domestic markets of the Soviet Union, but it also trades with its Asiatic neighbors There is a long-standing trade with China across land boundaries, fur skins going into China and tea moving to Soviet markets The Soviet Far East buys rice, building materials, and equipment for fishing boats from Japan, and it sells lumber, coal, and fish to the Japanese

Arrangement of commercial routes. Commercial routes in Eastern Europe and Soviet Asia lead to four outlets—the Mediterranean, the Baltic, the Arctic, and the Pacific. The really valuable outlets are the two great arms of the Atlantic The remote Pacific outlet is reached over the long route of the trans-Siberian railroad, which

crosses great stretches of sparsely settled country The Arctic Route was opened to traffic only recently, and its commercial importance still is slight

The densely peopled area of Eastern Europe has access to the Mediterranean by way of the Black Sea, and the long-established wheat trade has made large use of this outlet The wheat-growing area has a close network of railways (Plate V), but the Danube, the Dnieper, and other rivers also form trunk lines leading to the Black Sea The general north-south direction of streams in the Black Soil Region makes the waterways useful also for trade between the northern forests of Soviet Europe and the treeless wheat lands.

The Baltic outlet offers the shortest water route to the important markets of Western Europe, particularly from the lumber-producing belt No extensive river system leads to this outlet, but many short streams serve for floating logs to the seaboard from the forests of Finland and the Baltic States In Soviet territory numerous railway lines and important inland waterways focus on the port of Leningrad, and canals have been cut across low divides to provide a continuous waterway from the Baltic to Moscow, the greatest collecting and distributing center of Soviet Europe

Mineral Wealth of Eastern Europe. While Eastern Europe is mainly an agricultural area, it does contain valuable mineral deposits accessible to the densely peopled belt It has manufacturing industries of growing size and variety, based on the products of its mines. In addition, manganese ore and petroleum are important exports; and Eastern Europe ranks as a major world source of both Mineral deposits occur in three general sections—the northwest, the east, and the south

Mineral resources of the northwest. The section of Eastern Europe between the Gulf of Finland and the shores of the Arctic and the White Sea resembles the Laurentian Upland of Canada in its mineral resources It yields aluminum ore near Leningrad, copper in southeastern Finland, and phosphate rock and nickel in the Kola Peninsula Most of the deposits were unknown until recently, and probably the wilderness has not given up all its secrets even now The phosphate and nickel deposits are in the mountain range that forms the backbone of the Kola Peninsula and are only a few miles from the railway built to connect Leningrad with the ice-free port of Murmansk on the Arctic (Fig. 286). The mines and the nickel smelter

Sovfoto

Fig 289 Iron ore outcropping at the surface in the Ural District The ore of the Soviet Union's Magnet Mountain has an iron content of 65 per cent or more A new manufacturing city, Magnitogorsk, has grown up near this valuable ore deposit

now furnish work for thousands of people, and a busy community has grown up in a locality where only one house existed in 1934.

Mineral resources of Urals The Ural Mountains and neighboring sections of the plain contain important mineral resources The known resources lie principally in the southern half of the mountain belt, but coal has been found on the western flank of the range where it crosses the barren tundra Ural deposits include platinum, gold, chrome ore, petroleum, iron ore, copper ore, and small beds of coal. The older mines are in forested areas rising above the treeless plain, but the big production of iron now comes from the Magnitogorsk deposit of high-grade ore in the grassland area near the southern end of the range (Figs 289 and 286)

Southern mineral-producing belt The most important mineral-producing area of Eastern Europe is a broad belt along the southern margin of the great plain Deposits occur at intervals there in mineral-bearing rocks beneath the surface of the plain, or in the bordering mountains The belt includes the Carpathian section in the west, the South Ukraine District in the middle, and the Caucasus section in the east. Beyond the Caspian Sea the mineralized belt continues east-

ward. There it borders a thinly settled part of the great central plain, and only during the last few years have the rich mineral deposits attracted large-scale mining industries

The Carpathian section includes the mountain belt and the foothills on both sides The hilly strip on the outside of the mountain curve contains some highly important deposits At the north, near the German border, are the Polish zinc, iron, and coal deposits of Silesia, the chief metal-manufacturing district of Poland This district exports considerable quantities of coal across land boundaries To the southeast, petroleum deposits occur at intervals in Poland, but the largest output comes from the Rumanian fields on the southern flank of the range, 40 to 50 miles from Bucharest. A few big foreign companies, chiefly British and French, control most of the Rumanian wells. They have built up-to-date refineries in the oil fields and have laid a pipe-line system from the refineries to shipping points on the Danube and the Black Sea.

The Carpathian Mountains themselves, and also the foothills on the inside of the curve, have iron, copper, gold, and coal deposits of minor importance in Rumania and in Slovakia Hungary occupies a plain poor in mineral resources. Southwest of Budapest, however, in a hill range that branches off from the Carpathians and crosses the Danube, is the rich deposit of bauxite that furnishes ore for the German aluminum industry (p. 501)

The South Ukraine District of Soviet Europe, located north of the Black Sea, lies within the great plain itself (Fig 286) It is famous for its iron, manganese, and coal The Krivoi Rog mines, about 150 miles north of Odessa, produce a good deal of ore for export in some years, but the greater part of the output is smelted locally Manganese mines in this same general area yield ore for local use and for export. The Donetz coal field, north of Rostov, is named for a tributary of the Don River (Plate VI)

The Caucasus section produces petroleum, manganese, and copper. It contains two producing oil fields, one at the eastern end of the range and one on the northern flank Recent surveys have revealed the presence of oil in scattered localities from the Caspian Sea northward along the European side of the Urals nearly to the Arctic, but production still comes mainly from Caucasus deposits The peninsula at the eastern end of the mountains is the largest producing area and has big refineries at Baku Ships on the Caspian load oil at Baku,

and near the northern end of the sea they deliver their cargoes to specially built steel barges engaged in trade on the Volga Two pipe lines from Baku carry refinery products to the Black Sea port of Batum, where ships load cargoes for foreign countries A pipe line from the field on the northern flank of the Caucasus carries oil to the South Ukraine District, and a branch line runs to the Black Sea coast

2. *Forest Belt of Northern Eurasia*

Forest Products from Northern Fringe of Settlement. The forest belt of Northern Eurasia is a major source of lumber and other forest products for the manufacturing countries of Western Europe From the Baltic Sea and the Gulf of Bothnia forests extend across Eastern Europe and Soviet Asia to the Pacific (Figs 286, 287, and 24) They contain trees of the same general types as the forests of Canada and northern United States and furnish the softwoods used in large quantities for construction purposes They also furnish pulpwood for paper and rayon manufacture Exports from the forest belt include logs and pulpwood, mine props and railway ties, sawed lumber, wood pulp, and paper

Three sections of Northern Eurasia—two in Europe and one in Soviet Asia—furnish important quantities of forest products for shipment to other regions The first section is tributary to the Baltic Route and the second to the White Sea, the third is in the valley of the Yenisei In addition, the Soviet Far East produces some lumber for export to Japan.

Forest Area Tributary to Baltic Route. The area tributary to the Baltic Route exports wood pulp and paper as well as logs and sawed lumber It includes Finland, the Baltic States, and neighboring sections of Poland and Soviet Europe There, as in northern Minnesota and the Laurentian Upland of Canada, forests grow on hilly land dotted with lakes and swamps Log rafts are floated along waterways formed by rivers, lakes, and connecting canals Mills in port cities of Finland, Soviet Europe, and the Baltic States saw the logs into lumber, while other plants manufacture wood pulp and paper for export Much of the Soviet cut goes inland to mills that manufacture for domestic markets This forest area surpasses Scandinavia as an exporter of logs and lumber (Fig 290), but it is surpassed by Scandinavia in the export of pulp and paper.

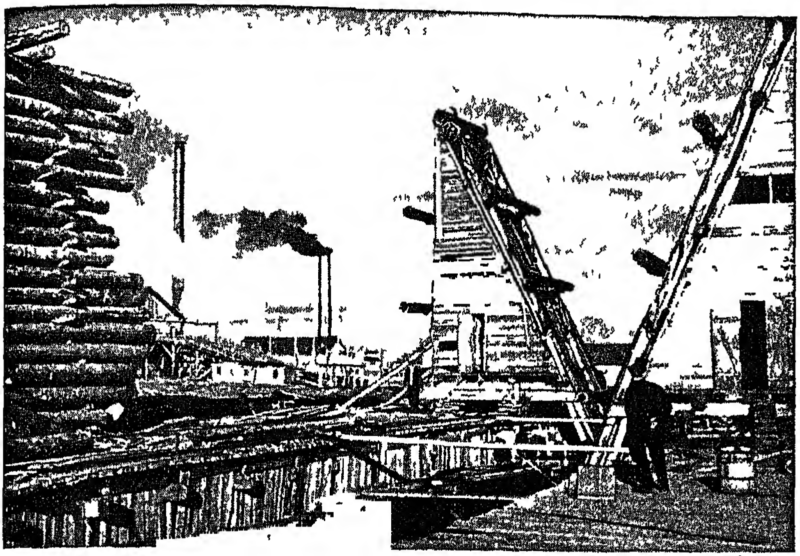
Sovfoto

Fig. 290 Loading sawed lumber on shipboard at Leningrad

Lumber Trade of the White Sea. Trade via the White Sea draws logs from a large area of Soviet Europe drained by the Northern Dvina and other north-flowing rivers (Fig. 286). Sawmills at the mouths of the rivers cut the logs into lumber. Archangel, located at the outlet of the largest river basin, has the largest number of sawmills.

The Yenisei Lumber Trade. The lumber trade of the Yenisei Valley has been in existence only a few years. Its beginning marks the opening of the Northeast Passage of which navigators have dreamed for four centuries. The difficulties and dangers of Arctic navigation account for the fact that great forest areas in Northern Eurasia remained untouched while Western Europe bought lumber from North America. Even during the short summer, floating ice and frequent fogs make the navigation of the Kara Sea dangerous. But fleets of freighters have carried increasing numbers of lumber cargoes out of the Yenisei region in recent years.

Science aids shipment through Arctic ice. Recent success in Arctic navigation is due to the application of modern scientific knowledge. More than 40 weather stations are maintained along the route through the Arctic, both on the mainland and on islands farther north. Ships and weather stations are equipped with radio apparatus. Thus the captains of the fleets know what weather is ahead, and the



Sovfoto

FIG 291 Moving logs by machinery at Igarka This new sawmill town, located north of the Arctic Circle, was not a town or even a settlement until 1929 The temporary appearance of the structures reflects the newness of the town, and the general use of wood suggests a scarcity of other building material

ships are guided through the Kara Sea to the mouth of the Yenisei by icebreakers Airplanes carry mail and supplies to the stations in the great northern wilderness

New sawmill town in northern wilderness Entering the wide mouth of the Yenisei River, the lumber fleets steam southward for three or four days across the flat and treeless tundra At the edge of the forest belt, 350 miles from the sea, the new sawmill town of Igarka has grown up to serve the Arctic trade (Fig 291) Great piles of sawed lumber await the ships, and in order that the ships may get away quickly there are men to help with the work of loading Since a vast wilderness surrounds Igarka, lumber-producers must bring men, food, and machinery from distant areas The nearest source of workers and supplies is the settled belt that extends along the trans-Siberian railroad from the Urals across the plain of the Ob River to Krasnoyarsk (Fig 287) River steamers travel up and down the Yenisei between Igarka and Krasnoyarsk, the junction point for river and rail transportation on the long route that connects the new sawmill town with older settlements.

Logs for Igarka sawmills Timber for Igarka sawmills comes from forests that extend up the Yenisei and its eastern tributaries for 800 to 1200 miles The logs are made into rafts, some of them a quarter of a mile long A large crew travels with the raft to steer it around curves in the crooked channel and to keep it away from sand bars The men and their families live in log cabins scattered over the huge raft, which moves only as fast as the current carries it and sometimes is on the way for more than two months The slow rate of speed is illustrated by the fact that often a man will row to the forest-covered bank, gather berries for the family dinner, and get back before the end of the raft has passed his landing place

Soviet Fur Trade. Eastern Europe and Soviet Asia together form one of the great fur-producing and fur-using areas of the world. The Soviet Union ranks next to the United States as a fur-producing country As in the northern part of the United States, the people use much fur for winter clothing Actually the Soviet Union is the more northerly country of the two, for it is in approximately the same latitude as Canada

Furs from northern forests To Moscow and Leningrad, principal centers of the Soviet fur trade, come furs from widely scattered parts of Northern Eurasia Such pelts as fox, ermine, squirrel, and sable are collected by trappers in the northern forest and tundra, and some of them are collected also in agricultural areas by people who trap wild animals in winter as a side line These are examples of the true fur skins Many of the finest and most costly furs, such as sable, come from remote forests beyond the Yenisei.

The fur-collector forms a link between the fur trade of European cities and the trapper in the remote northern woods of Soviet Asia. Gradually, as he visits the scattered cabins of the trappers, his supply of knives, ammunition, and other trading goods diminishes, and his dog sledges are loaded with furs. Slowly he makes his way back to one of the fur-collecting and fur-shipping cities, such as Yakutsk on the Lena River or Irkutsk on the trans-Siberian railroad (Fig 287). However, the airplane now takes an important part in the fur trade of this remote region.

Fur production as a livestock industry. The fur trade does not depend wholly on hunting (pp. 7–9). Fur farming is a relatively new livestock industry, but it has become important in both North America and Europe. The breeding of silver foxes is the best-known

Sovfoto

FIG 292 The director of the Leningrad Fur Auction inspecting stock to be offered for sale The picture was taken a few days before the summer auction of a recent year

branch, and Soviet breeders furnish several thousand silver-fox skins annually Soviet fur farmers send millions of rabbit skins to market every year, and they are meeting with some success in breeding sable Sable farming still is in an experimental stage, but the possibility of raising the "royal fur of tradition" greatly interests furriers, for the wild sable has become scarce

In addition to the true fur skins, the fur trade handles millions of skins that sell under such names as Persian lamb, karakul, and broadtail These are the skins of very young lambs of special breeds raised in the arid plains of the Soviet Union and the highlands of Iran and Afghanistan The skins are collected in spring (and sometimes also in autumn) and are cured by rather simple methods before shipment Large numbers are used in Eastern Europe, but such skins form an important item of export from the Soviet Union, entering world trade as material for women's coats

Fur centers and auctions From many sections and over many routes the furs gradually make their way to Moscow, where fur ware-

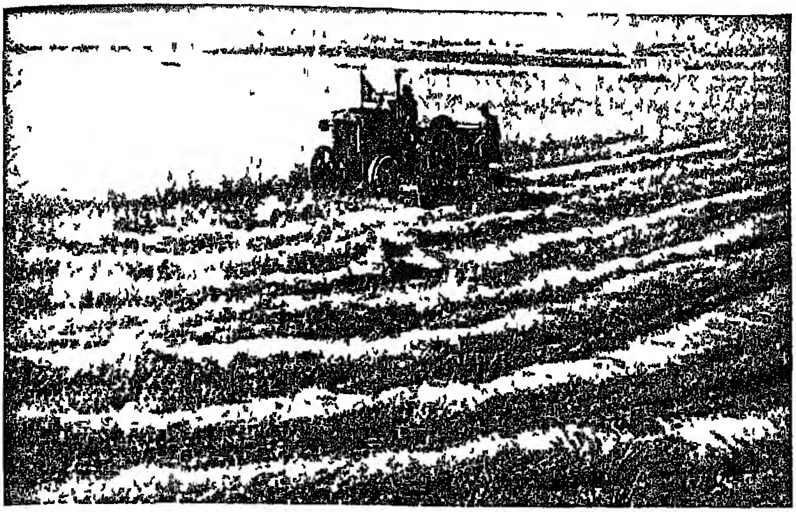
houses and a large fur factory have been built. Some furs may go directly to Leningrad for the auctions at which several million dollars' worth of fur skins are sold each spring and summer (Fig. 292) To the Leningrad auctions go buyers from Soviet clothing-manufacturing centers and foreign buyers from the United States, France, England, and many other countries.

3 *The Long-Settled Plain*

Four Major Divisions. The long-settled area of the great central plain has a north-south width of a thousand miles and an east-west length twice as great Resources and products differ from place to place, particularly in four contrasted divisions The two divisions of largest population are agricultural belts that extend across Eastern Europe The more northerly, the Dairy-Flax Belt, covers the area that contains the cities of Helsinki, Riga, Moscow, and Gorki (Fig 286) The more southerly is one of the world's great wheat-growing grasslands It includes the Danube plains of Hungary and Rumania and the famous Black Soil Region of Soviet Europe The third division is the Ob Agricultural Region of Soviet Asia (Fig 287) The fourth is the grazing region about the Caspian Sea and Lake Aral

The Dairy-Flax Belt. The Dairy-Flax Belt of Eastern Europe occupies the area of mixed-forest soil that extends from the coast of the three Baltic States and southern Finland across northern Poland and Soviet Europe to the Ural Mountains. It has a population of moderate density in the north, and the density increases southward (Figs 286 and 285) Swamps, peat bogs, and stony hills cover much of the surface, particularly in the north, and in many districts more than half the land remains in forest. Thus the belt has forest industries as well as agriculture, producing firewood, lumber for building purposes and export (Fig. 290), and wood for the pulp mills in Baltic ports.

A northerly agricultural area. The Dairy-Flax Belt is one of the most northerly of important agricultural areas, for it lies in the latitude of southern Alaska and northern Labrador (Fig 1) The soils, though richer than those of the coniferous forest area farther north, are not so rich in humus as the grassland soils of the south The summers are short and cool (Fig. 288), but daylight lasts for seventeen hours or more in midsummer, and the long days stimulate the



Sovfoto

FIG 293 Harvesting flax in the Leningrad section of the Dairy-Flax Belt Irregular rounded hills, like those in the distance, are characteristic of this belt, as they are also of the North American Dairy Belt The use of agricultural machinery is new in Eastern Europe, and the two men who are cutting the flax show their lack of skill by leaving a good deal of flax standing

growth of crops The rainfall is fairly regular, and rarely do the crops suffer from drought The cool summers and the light-colored forest soils do not encourage the cultivation of wheat and corn Rye is the staple bread grain, and root crops are grown both for human food and for stock feed (Figs. 273 and 274) There is a little sugar-beet culture in the west, but potatoes are much more widely grown than sugar beets

Production for export Though it produces many crops for local use, the Dairy-Flax Belt is represented in world trade mainly by a few exports—butter, pork and poultry products, and flax fiber (Fig 293). It produces a third or more of the flax fiber entering international trade, but the amount spun and woven locally is much greater than the export volume

Flax fiber, unlike cotton, is contained in the stem of the plant After harvest two other operations take place in the flax-growing locality to prepare the fiber for the spinning mills First the harvested plants are retted (rotted) to weaken the woody material of the stems This is done either by soaking them in water for from six to fourteen

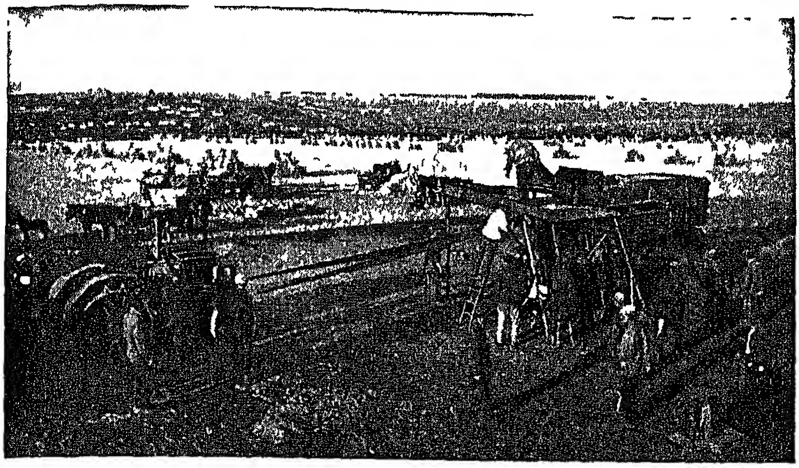
days or by leaving them spread on a field for several weeks, exposed to the weather After retting, the flax is dried, and then it undergoes scutching, a process which breaks the woody material and removes most of it from the fiber.

Butter-making in co-operative dairies has become important in the Baltic States; and pork and poultry products are associated with the dairy industry, as in Denmark (p 519). In the Soviet portion of the belt, dairy cattle are not so numerous as in the area farther west, but the Soviet section does contain an increasing number of large-scale dairies which produce mainly for domestic markets

The Wheat Belt of Eastern Europe. The Wheat Belt of Eastern Europe has a long history as a source of staple foods for other regions. Ancient Rome got some of its beef supply from the Danube plains, bringing livestock across the narrow mountain barrier at the head of the Adriatic Sea Still earlier, Greek ships went to the shores of the Black Sea for wheat Before the World War, Russia and Rumania were furnishing nearly a third of the world's export wheat, while Hungary shipped large quantities to manufacturing districts within the Austro-Hungarian Empire A larger proportion of the wheat crop now is consumed within the producing countries, but in years of plentiful rainfall considerable quantities are exported Unfortunately, dry years often occur, causing crop failures Droughts are particularly severe in the east, and the Volga area sometimes fails to raise enough food for its inhabitants

Plain of the Middle Danube The plain of the Middle Danube (sometimes called the Hungarian Plain) is an important grain and livestock area divided among Hungary, Rumania, and Yugoslavia. It lies within a rim of mountains formed by the Alps, the Carpathians, and the mountains on the coast of the Adriatic Sea The Danube offers a valuable waterway across the plain, and, escaping through a gorge known as the Iron Gate, it provides a route to the Black Sea Lying near sea level and in the latitude of Minnesota, the plain of the Middle Danube has summers hot enough so that it produces corn as well as wheat.

In the plain of the Middle Danube the farmers live in villages surrounded by gardens and orchards Surrounding this cultivated strip is a broader belt of grainfields, which may extend to a distance of five or six miles from the village center Beyond the fields is an unfenced stretch of pasture where herds of long-horned cattle graze. The best



Sovfoto

FIG 294 Threshing wheat in the Kiev section of the Black Soil Region Note the village, in which are the homes of the peasant farmers Note also the nearly level surface in the foreground, and the rolling land beyond the wheat field

wheatlands belong to those villages that occupy the broad strips of alluvial land bordering the Danube and other rivers There the fields also produce corn, sugar beets, and tobacco Between the alluvial strips are sandy uplands devoted principally to pasture But there are some scattered upland settlements where people grow rye, potatoes, and fodder crops for local use.

The Black Soil Region The Black Soil Region resembles the Spring Wheat Region of North America in some respects It lies in the same latitude and in the interior of a great land mass It has long and cold winters with frozen ground and snow Melting snows cause swollen rivers in spring, and in summer the smaller streams often become nearly dry Both regions have fine-textured grassland soils, both grow barley and oats as well as wheat, and in both regions the farmers face the danger of drought

The heart of the region is a broad belt of deep black soil lying well back from the Black Sea coast (Fig 294). This central belt produces sugar beets and Russian tobacco as well as wheat and barley. The Soviet Union contains nearly a third of the world's sugar-beet acreage, and the Black Soil Region is the principal Soviet sugar-beet area. Sugar beets are particularly important near the Dnieper River, thence the producing area extends in a northeasterly direction to the Don and

southwestward into Rumania. Yields are not wholly satisfactory, and agricultural experts are urging growers to rotate their wheat and sugar beets with clover or some other legume. The soybean, recently introduced from areas of light rainfall in Eastern Asia, is meeting with some favor for this purpose.

On the northern margin of the wheat and sugar-beet area there is a gradual change in the nature of the land and in crops. Occasional patches of woodland and of thin grayish soil indicate a transition to the belt of forest soils. Marshes cover large areas in eastern Poland and neighboring parts of Soviet Europe. Rye and wheat both appear in the landscape of this transition area, sugar beets give way to potatoes, and hemp and buckwheat form new members of the crop combination.

The southern margin of the Black Soil Region is an area of agricultural variety. Summers are warmer than in the central portion, and the soils have a brownish tinge. Corn ripens during the hot weather of the long frost-free season, and grapes and orchard fruits are grown on sunny slopes, particularly in the Crimean Peninsula. Corn ranks as a major crop and is the principal food grain of Rumanian peasants. On their small farms it occupies more land than does wheat, and very commonly garden vegetables or beans grow between the rows.

Toward the east the rainfall of the Black Soil Region decreases and the drought hazard becomes more serious. East of the Don the sugar beet declines in importance and the sunflower appears as a farm crop. In the semiarid Volga area the sunflower outranks corn in importance. It is grown principally for the oil contained in its seeds, but people also eat the seeds as Americans eat roasted peanuts. A drought-resistant grain sorghum from Palestine now appears among the crops of the semiarid border of the Black Soil Region. It was introduced by scientists who are looking for ways to make that area more productive.

Ob Agricultural Region. The agricultural area drained by the upper Ob River and its tributaries may be considered an extension of both the Dairy-Flax Belt and the Black Soil Region. It contains large tracts of rich black grassland soil and smaller patches of gray soil that have been cleared of their forest cover. The farms produce both wheat and rye, flax has some importance, and there is a little sugar-beet culture in the south.

The Ob Agricultural Region has a population much less dense than that of Eastern Europe, and it regularly produces more food than its own people need. Therefore it ships wheat, butter, and eggs to other parts of the Soviet Union and to Western Europe. There is a considerable amount of unplowed grassland in the settled area, and a typical farm village has, in addition to its cropland, several thousand acres of wild grass fenced off for pasture. Farmers use agricultural machinery, grain elevators rise above the level plain, and hundreds of creameries make butter for export. Exports move over the trans-Siberian railroad, and the Ob and its larger tributaries form feeder lines. The principal railway stations are located at river crossings, where rail and water traffic meet.

Caspian Grazing Region. Between the Ob Agricultural Region and the mountainous southern boundary of the plain is one of the problem areas of the Soviet Union (Fig. 287). The rainfall of the Caspian Grazing Region is too scant and irregular for crops, and in only a few places do streams from more humid areas provide water for irrigation. In general the region has frosty winters with snow. During the cool spring months, after the melting snow has moistened the ground, grass springs up and for a while furnishes pasture for flocks. Lying at low altitudes and far inland, the Caspian plain has summers as hot as those of southern Texas. With the coming of hot weather the soil becomes dry and the grass stops growing. Then the shepherds must lead their flocks to the mountains on the south or to the cooler and less arid lands at the northern border of the region.

The Caspian Grazing Region has some importance in Soviet trade. The flocks of nomadic herdsmen provide many of the karakul skins and other lambskins that enter the fur trade, and certain varieties of Oriental rugs, such as Bokhara, represent the handicraft industries of desert people. In many cases both lambskins and rugs are sold under the names of commercial centers in the desert plain or the neighboring highland. Fur-dressers and rugmakers have been organized into co-operative groups recently in order to improve their arts and to provide better marketing facilities.

Special products come from irrigated districts in the southern part of the region, where many streams from the mountains flow out on the plain (Fig. 295). Located in the latitude of the Carolinas, these oases have summers long enough and hot enough for rice and cotton. Many of the settlements have existed for a long time, growing crops

for local use and for sale to desert nomads and, in addition, shipping cotton to Moscow Large irrigation works have been built recently in order to provide water for new cotton fields, long-staple cotton has been introduced, and agricultural experts are working to improve methods of cultivation

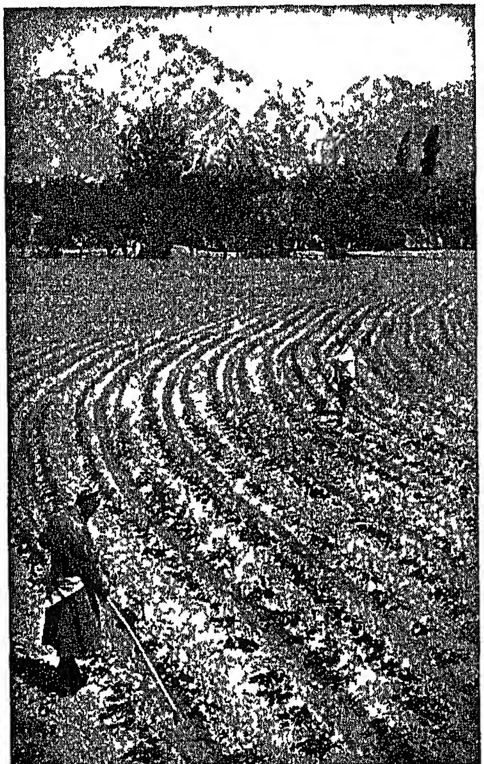


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Fig 295 A cotton field in the southern part of the Caspian Grazing Region The size of the trees indicates that this is an oasis settlement of long standing Many such oases occupy favored sites at the foot of mountains in the area beyond the Caspian The recent emphasis on cotton-growing in this area has come about as a result of government interest in the crop

Manufacturing Districts of Eastern Europe. Eastern Europe is known in commerce for its agricultural products, but it has manufacturing industries of importance Handicraft industries are widespread, including such lines as toy-making, spinning and weaving, pottery-making, and the curing of fur skins Rather large-scale factories prepare certain products for export. Among these are the pulp and paper mills of the Baltic coast, the flour mills of Black Sea ports, and the petroleum refineries of the Rumanian and Soviet oil fields. In addition, many new textile mills and other factories have been established in the various countries during recent years for the purpose of supplying domestic markets and thus reducing imports In Soviet Europe, where factories produce for a huge domestic market, the Moscow and South Ukraine manufacturing districts (Fig. 286) have developed, and Leningrad has become a large manufacturing city.

The Moscow District The area that includes Moscow and Gorki is the most highly developed manufacturing district of the Soviet Union Modern manufacturing developed there at an earlier time than in most of the country, and the output surpasses that of other Soviet districts in variety. The factories turn out textile fabrics, machinery, automobiles, and a wide variety of other products for use within the country In this district are concentrated many of the industries that require a high degree of skill, such as the making of surgical instruments, microscopes, and watches Other districts manufacture machinery, but they get the ball bearings for their machines from Moscow factories

The Moscow District secures fuel for power from four main sources (1) the lignite field in the southern part of the district, (2) the numerous peat bogs of the surrounding area, (3) the Donetz coal field, and (4) the petroleum fields of the Caucasus area Increasing numbers of factories are run by electric power generated in plants that burn peat, lignite, coal, or petroleum, and the various electric stations are organized into a super-power system (p 286)

South Ukraine Manufacturing District The South Ukraine Manufacturing District lies within the densely peopled Black Soil Region (Fig 286) It is characterized by heavy manufacturing, in contrast to the fine manufacturing of the Moscow District Its industries utilize rich local resources The Krivoi Rog iron ores resemble the Lake Superior ores of the United States, about 50 miles from the iron mines is one of the world's major deposits of high-grade manganese ore; the Donetz field, only 250 miles away, contains coal of coking quality, and the Dnieper River furnishes hydroelectric power as well as a navigable waterway The South Ukraine District provides much of the partly manufactured iron and steel needed in the Moscow District, and it manufactures railway locomotives, blast furnaces, and the heavy machinery used in mining and at hydroelectric stations.

4. *Expanding Eastward*

Commercial and Agricultural Expansion. The history of settlement in America records a long-continued westward movement of pioneers, in Soviet lands, pioneers moved in the opposite direction. Between 1400 and 1700, Russian rulers extended their authority over the vast fur-producing area of northern Asia. Fur-trading led to the

discovery of precious metals in the area, and mining created a need for agriculture Some serfs were moved to new lands owned by the royal family; political opponents of the government, lawbreakers, and prisoners of war were sent to work in Siberia, and occasional groups of peasants left Europe of their own accord, particularly after serfdom was abolished, about the time of the American Civil War But the really large movement of settlers into the Ob Agricultural Region began in the early 1900's, after the opening of the trans-Siberian railroad had reduced the hardships of travel and made the export of wheat possible

Recent Industrial Expansion. The last few years have seen a new wave of migration into Soviet Asia The new movement has involved the work of scientists, it has resulted in greatly increased mining activity, and new manufacturing cities have sprung up Development has been particularly spectacular in the Ural and Altai districts (Fig 287), where new industries utilize mineral deposits in the Ural Mountains and in the hilly belt near the western end of the Altai Mountains Until recently these deposits, remote from the densely peopled sections of Europe, were little used and not fully known

Increased output of mines Formerly an exporter of grains and an importer of metal manufactures, the Soviet Union has increased both the size and the variety of its mineral industries. In the last few years its mining industries have taken from the earth more coal, asbestos, chrome ore, iron ore, manganese ore, and petroleum than ever before, it has gained second place among gold-mining countries, and mines within the country are producing much of the lead, copper, and zinc required by domestic industries In return, much of the machinery needed for mines and smelters is made in domestic factories Increased mine production came about after extensive surveys were made by men with training in geology or experience in mining At times, hundreds of expeditions have been at work in different parts of the country.

Ural Manufacturing District. The Ural District, occupying the southern half of the Ural mountain belt, has become one of the major metal-working areas of the Soviet Union. It produces largely for the rapidly developing area on the east. For many years the mountain belt had produced gold, platinum, and chrome ore from its mines, and small iron furnaces in the forest had smelted ore from minor deposits. The rich Magnitogorsk deposit (Fig 289) near the south

end of the mountain belt lay unused because the surrounding grassland had neither wood nor coal for smelting Now blast furnaces and steel mills stand at the foot of a mountain of magnetic ore, while coal is brought by rail from distant mines Near at hand are by-product coking plants, and chemical factories have been built to utilize the by-products The district builds heavy machinery for mines and smelters, tractors and other machinery for farms, and rails and rolling stock for new railways It smelts and refines copper and zinc, taking ore from local mines and receiving concentrates and crude metals from newer mining districts in Soviet Asia

Altai Manufacturing District The Altai District contains two metal-manufacturing centers in the hilly belt between Lake Balkhash and Krasnoyarsk (Fig 287). Both are on branch lines of the trans-Siberian railroad Stalinsk is an iron and steel center with local resources of coal and iron ore, but it also receives ore from Ural mines Ridder, located in the foothills of the Altai Mountains, is interested in nonferrous metals Its mines yield zinc-lead ores which contain smaller quantities of copper, gold, and silver It uses coal from mines near Stalinsk and from the Karaganda field north of Lake Balkhash

Industrial expansion and settled areas The distribution of manufacturing plants in Soviet Asia illustrates the importance of location in or near settled areas The big new plants of the Ural and Altai districts are near the margins of agricultural or grazing lands which furnish markets for metal products and provide both workers and foods Scattered metal-working plants have been established or planned within the Caspian Grazing Region at points where copper and lead deposits have been found. In contrast there is little mining (except for gold) in the upland east of the Yenisei River, though deposits of iron ore and coal have been discovered The vast upland of northeastern Asia still is one of the world's little-known regions

Baffling Problems Still Unsolved. Great areas in Eastern Europe and Soviet Asia still baffle mankind in his effort to occupy the earth The Arctic Route is open in summer, but even now ships are sometimes trapped in the ice in spite of scientific care Mineral wealth has attracted people to the Far North, but the Arctic plain cannot produce bread grains for the miners, and the amount of summer heat is so meager that the soil never thaws to depths of more than three or four feet. Rotation practices and the scientific use of fertilizer can

do much for soil, but gullies have been cutting their way into the Black Soil Region for a long time, and the damage remains The introduction of drought-resistant crops has done something for the semiarid Volga area, but drought still threatens the crops Reservoirs and canals provide water for the irrigation of new farms beyond the Caspian Sea, but there is water for only a small part of the land Mankind still depends upon the earth with its sunshine and rain, and many forces are beyond his control

QUESTIONS

A *Natural conditions and food production*

1 What are the principal food products exported from Eastern Europe and Soviet Asia to Western Europe? What division or divisions of the area does each represent?

2 What food product is suggested by Figure 294? What probably is the color of the soil in the fields? If the field beyond the grain shocks is occupied by a root crop, what crop is it likely to be?

3 Which graph in Figure 288 represents the wheat-growing area of Eastern Europe? How do the summer temperatures of Bucharest compare with those of Moscow? What bearing has this fact on the suitability of the two areas for growing corn? (Compare with Mount Vernon, Fig 128)

4 What food products do the farms of the Ob Agricultural Region offer for sale? Where are their principal markets? What transportation facilities has the region?

5 What is the principal food grain used in the butter-exporting area of Eastern Europe? Why (pp 513–514 and 540–541)?

6 Compare Moscow and Archangel as to the number of warm months (average temperature above 50° F) in the year Why is there a difference? What bearing has it on population density?

7 Is the warm season in the mining district of the Kola Peninsula probably longer than that of Archangel, shorter, or about the same? Why? What bearing has this fact on the food problems of the mining community?

8 What part of Eastern Europe has a large acreage of potatoes (p 514 and Fig 274)?

B *Resources and manufacture*

1 What areas contain the principal power resources utilized in Eastern Europe and Soviet Asia?

2 Which Soviet district has the most highly developed industries? What power resources does it make use of? Does it owe its rank chiefly to natural resources, experience, or location?

3 What relation probably exists between the industry illustrated by Figure 293 and the industries of the Moscow District?

4 What important fertilizer minerals are mined in the Soviet Union (pp 471 and 532)? Where?

5 What relation is there between the agricultural industry shown in Figure 295 and the industries of the Moscow District?

6 Since the mineral resource shown in Figure 289 outcrops at the surface, why was it not mined until recently? Where is it utilized at present?

7 How do the Moscow and Altai districts compare as to (*a*) typical lines of manufacture, (*b*) local raw materials available, and (*c*) importance of surrounding area as market?

EXERCISES

1 *Glimpses of contrasted localities*

Indicate by numbers on an outline map the localities shown in Figures 289 to 295 inclusive Prepare a legend to explain the numbers on your map Designate each scene either by the title given under the picture or by a title of your own choosing

2 *Eastern Europe and Soviet Asia as a source of furs*

Study Figure 292 and prepare to talk on the following points (1) kind of room shown, and indications as to size of stock, (2) parts of Eurasia probably represented by the stock, (3) various occupations responsible for securing the furs, (4) occupations responsible for assembling them, and kinds of transportation probably used, (5) business of the man, and important event for which he is preparing, (6) countries represented by buyers who are likely to attend, (7) occupations whose work still is necessary before the furs will be ready for use

3 *Beyond the Caspian Sea—a landscape study*

Study Figure 295 for information on the following points (1) kind of crop that occupies the land in the foreground, (2) size of plants as compared with those in Figure 157, (3) indications that the picture was taken outside of the United States, (4) indications that the crop depends on irrigation, (5) probable source of irrigation water, (6) probable market for the crop, (7) other uses of land shown in the picture

Suggest possible reasons why the government should prefer to have cotton grown on this land rather than rice or other food crops

6

COMMERCIAL RELATIONS WITH THE ORIENT

CHAPTER XXXVII

THE ORIENT AND ITS COMMERCIAL SETTING

The Orient and the Occident. The Isthmus of Suez separates the Red Sea, an arm of the Indian Ocean, from the Mediterranean Sea, an arm of the Atlantic Commercially, this narrow neck of land also separates the Orient from the Occident, the East from the West, Asia from Europe These two great divisions of the earth are sharply contrasted in many ways The Orient, for example, is the seat of ancient civilizations which in modern times have changed but little The Occident also has ancient roots, but in modern times it has undergone revolutionary changes, especially in science, manufacturing, transportation, and commerce Therefore, when the Suez Canal was cut across the isthmus in 1869, it not only opened a new route from the Atlantic to the Indian Ocean but also brought the ancient industries of the Orient and the modern industries of the Occident into closer contact than previously had been possible

Trade Routes to the Orient. In addition to the route by way of Suez, the Orient is reached from Europe by a branch of the Good Hope Route around Africa (Fig 28) But a ship on the Good Hope Route to India sails more than 4000 miles farther than if it had gone via Suez This means about ten days longer on the ocean and higher costs for wages, food, fuel, and the like. Vessels on the Good Hope Route, however, avoid the high tolls at the Suez Canal. Nevertheless, even with high tolls, the Suez Route is the main connection between Western Europe and the Orient

From Western United States, the North Pacific Trade Route is the major route to the Orient (Figs 28 and 296). From our west-coast ports regular services to and from the Orient are maintained by American, Canadian, British, and Japanese steamship companies Some vessels take the longer course via the Hawaiian Islands in order to call at Honolulu, while others follow the more direct northern lanes Our Gulf and Atlantic ports also have services to the Orient via the Panama Canal and the North Pacific Route. A large amount of shipping operates regularly from New York to India via Suez, much of our trade with the Western Orient moves over this route Some American shipping, moreover, follows a route round the world by sailing from New York via Panama, the North Pacific, Singapore, Suez, Gibraltar, and the Atlantic

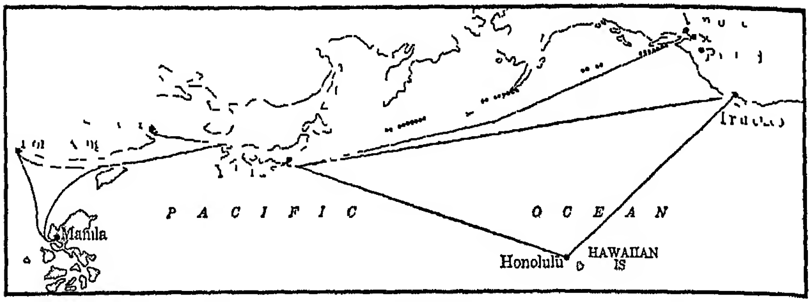


Fig 296 The North Pacific Trade Route Dotted line shows shortest distance

The Orient is reached also by the long arm of the trans-Siberian railroad and by air services from Western Europe and the United States The trans-Siberian railroad is the longest railway in the world, and in connecting the old civilizations of Europe and Eastern Asia it crosses a vast extent of pioneer country Air services from Western Europe to the Orient follow the general direction of the Suez Route Regular services are offered from the United Kingdom, France, and the Netherlands—countries with important Oriental possessions From the United States the famous "China Clipper" planes connect San Francisco, Honolulu, Manila, and Hong Kong

Populous Areas Distinctly Separated. The Orient contains about half of the world's population Most of the people live in three countries—China, India, and Japan With the exception of Java and a few other small areas, the rest of the Orient is only sparsely or moderately settled (Fig 1) Of the three large populous areas, China is separated from Japan by broad arms of the sea, and India is separated from China by an expanse of difficult mountain ranges and deep valleys Java, with its 40 million people, lies south of the equator and is separated from the other areas of dense population by 2000 miles of water. For example, Batavia, in Java, is 1972 miles from Canton and 2164 miles from Calcutta Both distances are greater than that from St John's, Newfoundland, to Liverpool (1926 miles).

The Orient as a Consuming Area. Because of its vast population the Orient forms an important consuming area (Chapter I), even though the people in general have very little to spend Hence the commercial nations of the West are greatly interested in the Oriental trade Dealings with Western Europe and the United States account for more than 40 per cent of the international trade of Oriental coun-

tries Trade among the Oriental countries themselves makes up another 40 per cent of their total foreign trade

Agriculture Supports Most of the Population. Most of the people of the Orient are farmers In fact, about 60 per cent of the population in Japan and 75 per cent in China and India are supported by agriculture Tillable land is a prized possession, and in many sections the soil has been carefully cultivated for centuries Unfortunately, much of the Orient is made up of mountains and hill country Steep slopes make farming difficult or impossible, and in many areas cultivation is restricted to the valley floors and lower slopes Furthermore, large sections of the Orient are too dry for crops Probably not more than 30 per cent of China, for example, is suited to the production of crops. The Orient, however, does contain some famous farming areas The plains of the Hwang, Yangtze, and Si rivers in China and of the Ganges and Brahmaputra rivers in India rank among the major agricultural areas of the world These areas teem with people and are the seats of ancient civilizations

Mineral Resources Less Than Those of Lands about the Atlantic Basin. On the whole the Orient is poor in minerals Although the mineralized areas (Fig 27) contain a great variety of minerals, in most cases either the quantity is not large or the quality is poor Of the mineral deposits now known, the only ones which promise to be of major significance in world affairs are the coal, antimony, and tungsten of China, the petroleum of the Netherlands Indies, Burma, and the Persian Gulf region, the iron ore and manganese of India, and the tin of the great tin-producing zone of Southeastern Asia None of the countries bordering the western Pacific appears to have resources of iron ore, copper, lead, zinc, gold, or silver comparable to those of the lands tributary to the Atlantic Basin

The Orient Is the World's Largest Source of Tin. Tin is the most distinctive and important mineral product of the Orient About two thirds of the world's supply comes from the "tin zone" that extends from southern China through Burma and the Malay Peninsula to the East Indies Six countries mine tin ore in this belt The leading four, in order of production, are British Malaya, the Netherlands Indies, Siam (Thailand), and China The largest output comes from the Malay Peninsula. The tin-mining area of the Netherlands Indies consists of three small islands that represent an extension of the mountain backbone of the peninsula. In addition to the output of these mines in

Southeastern Asia, some tin comes from the Bolivian Andes and some from relatively new mining districts in Tropical Africa.

British Malaya leads all tin-mining countries, and tin-mining is a major industry there Most of the ore comes from placer mines in alluvial deposits, but in some mines veins in bedrock are worked A few small producers use primitive placer methods, but more commonly the ore is mined with bucket dredges and other power machinery. Chinese miners have worked the deposits of the "tin zone" for centuries, and even at present nearly a third of the tin produced in Malaya comes from mines owned and operated by Chinese.

Most of the Oriental tin ore is smelted before export The principal smelters are in Singapore and Penang (Fig 321) The Singapore smelter treats ore from Siam, Burma, and other countries as well as from Malaya In addition, there are many small-scale smelters in the tin-mining areas, and much ore from Dutch territory goes to the Netherlands for smelting

Major Divisions of the Orient. Commercially the Orient divides into the Arabian, the Indian, the East Indian, and the East Asian regions (Fig 297) The Arabian Region is mainly desert and, except for its mineral possibilities, is of little importance to commerce The Indian and East Indian regions are very productive areas The former lies in the latitude of Mexico and Cuba, whereas the latter, crossed by the equator, corresponds in position to the Amazon Basin. The East Asian Region, however, lies mainly in middle latitudes. The Orient therefore displays climatic variety similar to that which one encounters in traveling from the Amazon to the St Lawrence basin. It offers an even greater variety of commercial products In this vast area four countries stand out—Japan, China, the Netherlands Indies, and India

Japan, the Major Commercial Country of Eastern Asia. Eastern Asia faces the Pacific, but in no place does the open ocean wash the mainland of the continent From north to south a long chain of mountainous islands forms the western boundary of the Pacific Between the islands and the mainland lie a series of great seas (Fig. 298). Japan occupies the larger islands in the middle of the chain, and in this commanding position dominates the commerce of Eastern Asia.

An island country Japan proper is an island country with a land area about as large as that of Montana. Most of this area consists of four islands. Honshu, the central island, is the largest and by far the

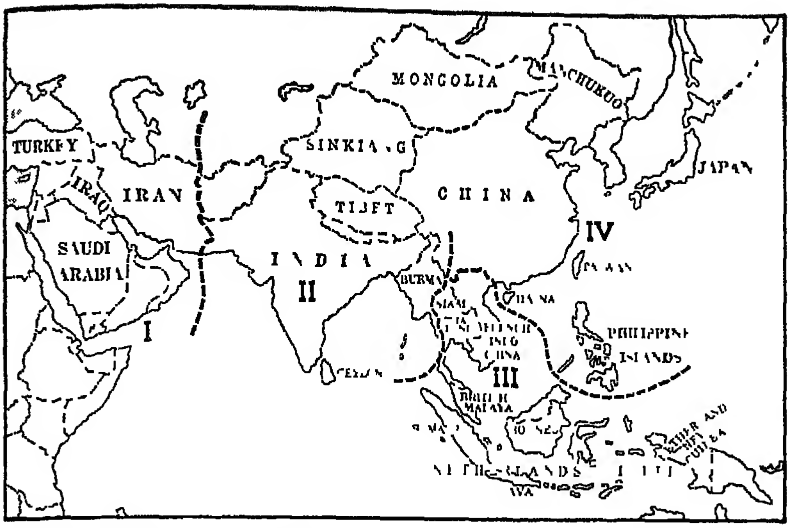


FIG 297 Countries and trade regions of the Orient I, Arabian Region, II, Indian Region, III, East Indian Region, IV, East Asian Region

most important In fact, Honshu is as outstanding in Japan as England is in the United Kingdom At the southwest the famous Inland Sea, with its densely peopled borders, separates Honshu from Shikoku and Kyushu At the north a narrow strait separates Honshu from Hokkaido The latter has a much cooler climate than the rest of the archipelago (Fig 299) and is less densely settled The climate of Honshu, Shikoku, and Kyushu is more favorable to crop production than is that of Hokkaido, for the summers are long and are almost as hot and humid as in moist tropical areas.

Japan becomes an empire Japan is a very old country, but until 1868 it had little or no contact with the rest of the world. Before that date the Japanese people were living as the people of Western Europe lived in the sixteenth century They made only small use of iron, and even pottery was produced mostly in villages for local use Not only did Japan refuse to trade with other nations but it also laid heavy restrictions on its internal trade Agriculture was carried on in primitive fashion, highways were poor, and sea-going ships were unknown.

In 1868 Japan opened its ports to foreign trade, and since then there have been rapid changes. Population has more than doubled, and the country has become an empire by adding Taiwan at the south, Chosen at the west, and Karafuto (the southern half of the island

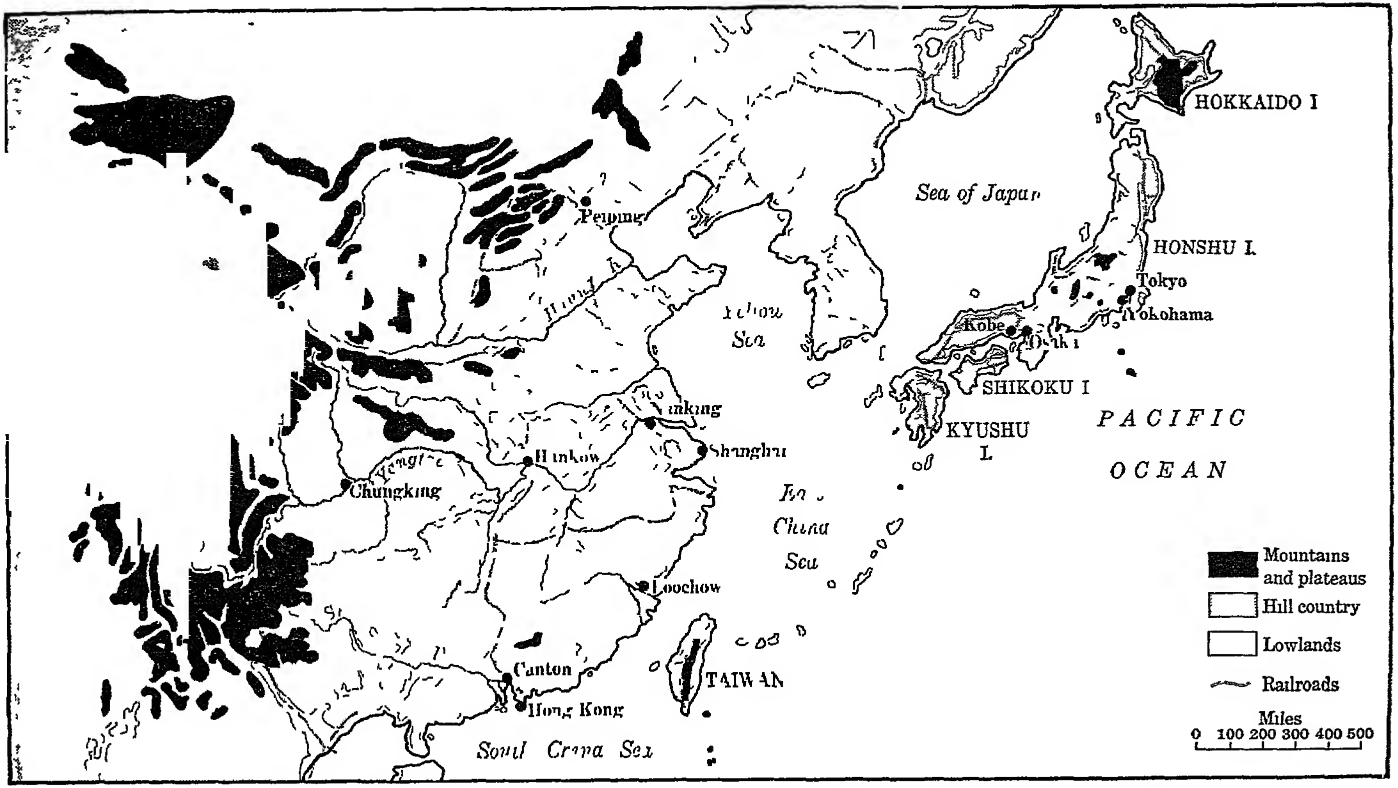


FIG 298 Major land forms and railways of China and Japan

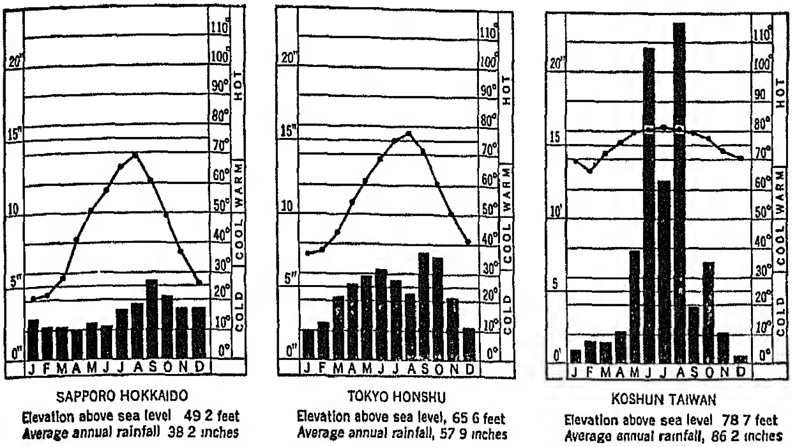


FIG 299 Temperature and precipitation at Sapporo, Hokkaido, Tokyo, Honshu, and Koshun, Taiwan

of Sakhalin) at the north In recent times Japan has extended its influence into Manchukuo and China

China, the Oldest and Most Populous Country. China is so unlike other parts of the Commercial World that it is almost a world by itself Although it is one of the big countries and contains more people than any other nation, it ranks in the third class of commercial countries (Fig. 29 and p 54) This low rank is more striking when one learns that China ranks high among the countries of the world in the production of rice, millet, wheat, barley, soybeans, peanuts, tea, and sweet potatoes The point is, of course, that all these food crops and more are needed to feed the 425 million people in the country

China, north and south China, as nature laid it out, is really two Chinas—the brown and dusty North and the green and humid South. The two parts are separated by the Tsinling Shan, an east-west range of mountains lying between the Yangtze and Hwang rivers (Plate VII).

North China has long, cold winters Its summers, though hot, are long enough for only one crop each year In some years the rainfall is too scant for crops, and famines result The Hwang-Ho and other streams which drain this north country are subject to devastating floods and corresponding periods of low water Streams with such varying flow are not navigable, and, except for a few railroads, most travelers and goods are carried in carts and on pack animals over the narrow roads and paths.

Humid China, south of the Tsinling Shan, has summers long enough for two or more crops each season. Crop yields are more stable and famines are infrequent. The amount of land well suited to crops, however, is restricted by the hilly or mountainous surface. Ridges and valleys succeed one another apparently without end; the only large area of tableland lies in the southwest. The largest level areas are the fertile bottom lands and delta plains of the lower Yangtze and Si rivers—areas dominated by Shanghai and Canton respectively. The land tributary to Canton lies in the latitude of the Gulf of Mexico and is tropical in climate and diversified in its crops.

The Yangtze waterway. The Yangtze is the great commercial artery of China. It drains humid country and, since it flows on a gently sloping bed, is navigable for large steamers up to Hankow. Smaller specially built vessels reach Chungking. Traffic on the main river is increased by that coming from many tributary streams and trails. Below Nanking many canals, some surfaced highways, and a few railroads furnish other means of transportation.

Unchanging China. Chinese civilization is very old. Its history began many centuries before the time of Christ and has continued to the present. Except in a few sections, life goes on now much as it did in early times. This is due in part to the difficulty of getting into or out of China. Great highlands and deserts at the southwest, west, and northwest make travel difficult in those directions. Broad gulfs and seas separate the country from Japan and the Philippines, and the long reaches of the Pacific separate it from the rest of the world. For centuries contacts with other people were discouraged by the government. Foreign trade was in the hands of small groups and was restricted to a few ports. But with the increase of ocean trade after 1800, new ports were opened and China's trade with the world increased. More recently, railroads and improved highways have been built between the major cities. Manufacturing on a modern basis is developing, and signs of future changes are in evidence.

The Netherlands Indies. Java is the center of the island empire of the Netherlands and is the most densely peopled, most intensively cultivated, and most productive tropical island in the world. The moist tropical climate, the rich volcanic soil, a native agricultural population averaging more than 670 per square mile, and the energy and thoroughness of the Dutch have combined to make the island highly productive. The agricultural activities are divided into two

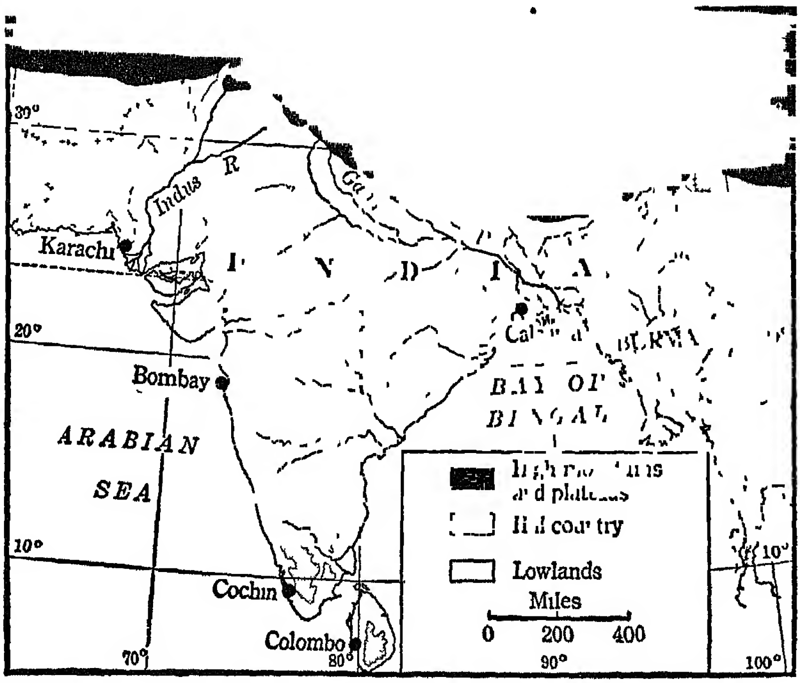


Fig 300 Major land forms of India

groups · estate agriculture, purely for the production of such export products as sugar, rubber, and spices, and native agriculture, to provide rice and the other necessities of life. Recently some of the natives have begun raising export products

The Netherlands acquired possessions in the East Indies through the efforts of the famous Dutch East India Company For nearly two centuries this company governed the islands, but in 1791 the islands came directly under the rule of the Dutch government Since that time they have been managed in such a way that a great export trade has been developed. Until recent times the Dutch completely controlled the rich trade, but during the World War, when trade with Europe became difficult, the islands began to trade directly with the United States and Japan. In some years imports from Japan have exceeded those from the Netherlands, but the latter still leads in the export trade. Largely because of its purchases of rubber, vegetable oils, and tin, the United States is the second-best customer of the islands.

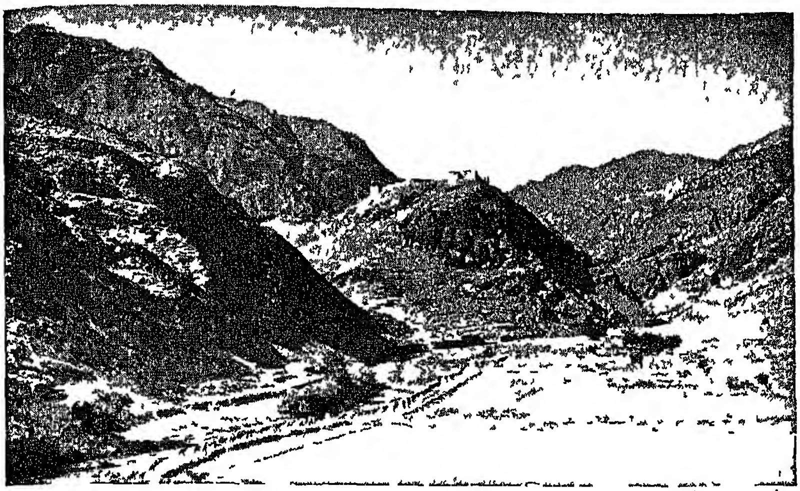
Johnston and Hoffmann

FIG 301 The Himalayas at sunrise, as seen from Darjeeling

India. India has an area of about 1,500,000 square miles, and about 340 million people live within its borders. Thus, with half the area of the United States, India has more than two and a half times the population The map (Fig 300) shows that India is a vast triangle the northern border of which is rimmed by the Himalaya Mountains —the elevated southern margin of the world's greatest highland (Fig 301) At the foot of the Himalayas a vast lowland plain extends from the head of the Arabian Sea to the head of the Bay of Bengal The western arid part of the lowland is drained by the Indus River, and the Ganges River drains the humid eastern section The Ganges plain ranks as the most fertile and populous section of India and has more than five times as many people as the Indus plain.

Southward from the Indus-Ganges lowland a peninsula with a regular coast line projects for more than a thousand miles into the Indian Ocean Except for narrow coastal plains, all the southern part of the peninsula is occupied by a low plateau At the north this plateau breaks into a belt of irregular hill country which extends from Bombay almost to Calcutta In the northeast, near the Ganges River, the hill country contains the principal coal field of India

With the exception of the northwestern section, India has a wet and dry tropical climate—hot and moist from May to September and warm and dry during the rest of the year (Figs 14 and 336) The combination of a long, moist growing period with broad, fertile low-



James Sawders

FIG 302 Khyber Pass, on the northwestern boundary of India Through this pass runs the principal route of travel and trade across the mountain barrier that separates the Indus Plain from the semiarid grazing lands of Afghanistan From the Indian side a railway (the most northerly of the lines shown in Fig 303) and a two-lane highway climb through the pass, extending some 20 miles beyond the Afghan boundary From the railway terminus, motor trucks operate over an improved road to Kabul, the capital and principal trade center of Afghanistan

lands and reasonably fertile uplands is the basis for the agriculture which supports most of the population

Farm land and other resources Probably half of India is cultivable In most areas the people live in villages but till the surrounding farm lands Although the methods of cultivation are primitive in many places, the farms feed the population of India and also provide four fifths of the export products In fact, except for its fertile land, India is a poor country with surprisingly little mineral wealth for such a huge territory In the future the rainy mountains in the north may provide hydroelectric power within easy reach of the populous lowland Possibly such power in association with abundant cheap labor and a big local market may be the basis of an expansion of manufacturing industries

India and the Empire India belongs to the British Empire and is composed of Native States under native rulers, and Governors' Provinces. The latter are administered by governors appointed by the king of Great Britain, who is also emperor of India. Some of the Native

States are huge areas comparable to Utah and Minnesota, others are tiny domains about the size of large ranches in the United States This combination of Native States and Governors' Provinces, each with its own trade regulations, hinders the easy flow of trade in the country Trade and other business relations are also made difficult by ancient customs and a great diversity of native languages It is said that there are more languages in India than in Europe

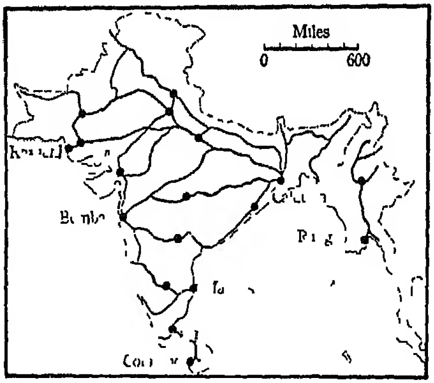


Fig 303 Railroads of India and Burma

India's membership in the British Empire has aided the growth of business and commerce. In early times there were frequent invasions by people from the west and northwest (Fig. 302) and frequent wars between the separate states. But under the British flag India enjoys peace, and peace favors production and trade The country no longer suffers from famines, for modern irrigation works have helped to ensure the regular growth of crops, and a country-wide system of railways (Fig 303) makes it possible to ship foodstuffs from one part of the country to another. Great ports have been developed, and frequent shipping services give India ready access to world markets.

QUESTIONS

1 What is the "Orient"? What are its major commercial divisions? What four countries are of outstanding importance in the Orient?

2 What densely peopled areas of the Orient are separated from each other by water barriers? Which are separated by barriers of rugged land?

3 What ocean routes connect the United States with the Orient? Which of these passes the greater number of countries with dense or moderate populations?

4 By what three ocean routes may the trade of Western Europe reach the Orient? Which of these is the shortest? the longest?

5 On what Oriental river may ocean vessels travel inland to a city located 600 miles from the sea? What is the population density of the area along this river?

6 What proportion of the people of the Orient are supported by farming?

7 Point out on a map of Asia (Plate VII) four famous agricultural areas In what ways is the importance of these areas related to rivers? Why is there much uncultivated land in the Orient?

8 What Oriental countries have important resources of minerals needed for steel manufacture? Which have important resources of mineral fuels (pp 309 and 337)?

EXERCISES

1 *The North Pacific Trade Route* (*Fig* 296)

Prepare a report on the North Pacific Trade Route, including the following points

a Ports at the eastern end of the route, at the western end

b Reasons why no ships follow the shortest line from Seattle to Yokohama (Does this line lie north or south of the steamship route?)

c Reasons why some ships sailing from San Francisco to Yokohama do not follow the shortest route

d Reasons why ships en route from San Francisco to Manila are likely to call at Yokohama and Shanghai

e Commodities (a farm product, a forest product, a mineral product, and a manufactured product) that are typical of the cargoes of westbound ships on the North Pacific Route (Use information gained from Chapters X–XXVIII)

f Reasons for thinking that passengers traveling from San Francisco to Manila via Honolulu would or would not experience freezing weather on the way

2 *The Suez Route to the Tropical Orient*

Investigate the commercial importance of the digging of the Suez Canal Consider the following points

a The tonnage passing through the Suez Canal ordinarily exceeds that moving via the Panama Canal Suggest probable reasons Which canal is older? How much older?

b Compare the Suez Route with the Good Hope Route as to (1) length and (2) opportunities for picking up cargo at intermediate points (Consider the commercial rank of countries along the two routes See Figure 29 and pages 54–56)

c Where in the Mediterranean section of the Suez Route may westbound ships load high-grade raw cotton for British mills (Fig 154)? Where in the Mediterranean section are coarse cotton goods available in large quantities as cargo (pp 505–506)?

d Suggest three oil fields conveniently located for supplying petroleum products to fuel stations along the Suez Route (pp 337 and 557)

CHAPTER XXXVIII

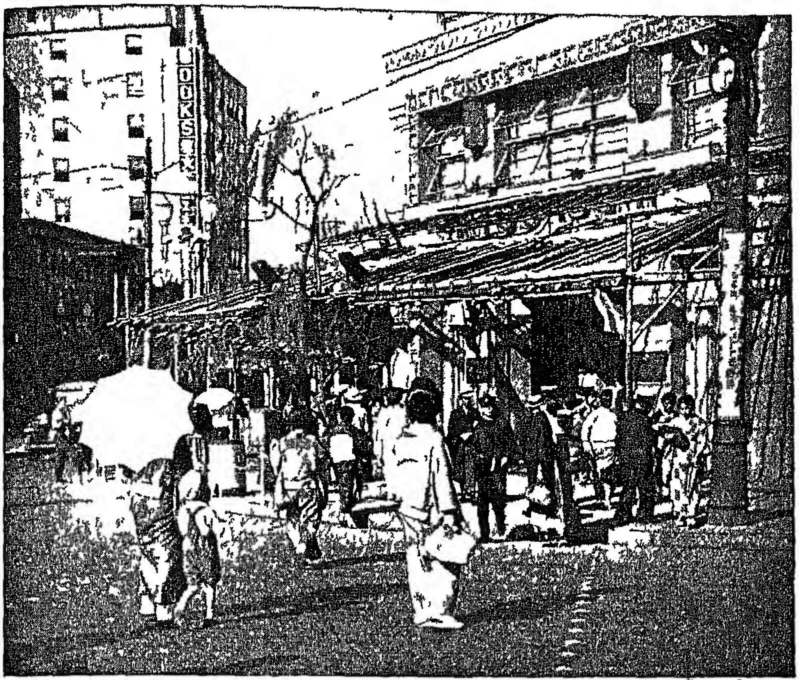
JAPAN'S PLACE IN THE COMMERCIAL WORLD

The New and the Old in Japan. Japan's industry and trade have grown so rapidly in recent years that the country is both old and new The new Japan is urban, and the changes are especially noticeable in the ports and other major cities Tokyo and Yokohama today give the impression of huge, busy, airy, and unusually clean American cities The major thoroughfares are wide, well-paved streets flanked by modern permanent structures Men go to work in European-style clothing, and the department stores have tearooms equipped in the best American manner. Since English is the language of commerce, the Japanese engaged in business and trade speak both Japanese and English Every street and business sign gives its direction or tells its story in both languages (Fig 304)

The country districts and the smaller cities remain unchanged They represent the old Japan The gardenlike fields may be neat and attractive, but the care with which the land is tilled suggests the congestion and poverty of much of the country In the cities, low unpainted wooden houses line the narrow lanes which serve as streets Sidewalks are rare and pedestrians crowd the streets. The clothing is Japanese and is of the simplest and cheapest sort Life goes on in the simple, frugal manner of the past Each year the population increases and the problem of making a living becomes more and more acute

Making a Living in Japan. Like Italy and the Soviet Union, Japan has been and still is an agricultural country More than half of the 70 million people of Japan proper gain their living directly from the land. Yet only 16 per cent of the country is arable land This means that the land is worked with the greatest of care, every square foot must yield its quota of food for the nation

The fishing, mining, and lumbering industries contribute to the support of the population Fishing is highly important, but mining and lumbering support only a small number of people With the foregoing conditions in mind, one can understand the importance of the recent rise of manufacturing and trade as means of employment Even with these recent additions to employment, however, the major support of Japan's ever-increasing population comes from its farms.



James Sawders

FIG 304 A street scene in Tokyo

Japanese Agriculture. Japan's best farm lands lie in small lowland areas widely and irregularly distributed in the major islands (Fig 305) Honshu, the principal island, has most of the good land As 75 per cent of the area of the islands consists of mountains or hills too steep for cultivation, broad stretches of wooded mountains and hills separate the farming areas. The plain about Tokyo, the largest of the farming areas, is only a little more than half the size of Connecticut

Farm villages and fields The Japanese farmers live in villages and farm the surrounding land (Fig 306) The average farm is less than three acres in size, which to us is the size of a market garden rather than a farm In many cases the farmer's land is made up of several tiny plots rather than a single piece. This arrangement increases his work, but may give him a variety of land and thus a variety of crops The fields are unfenced, for cropland is too precious to be wasted on fences Every possible square foot must be cultivated, for after his taxes are paid the farmer has unbelievably little with which to support his family.

Types of farm land Japan's farm lands are of two types—level irrigated rice lands and unirrigated fields (Figs 307 and 306) The latter are on those parts of the lowlands which are not irrigable, on the lower and gentler slopes of the uplands, and in mountain valleys Each of these types of land appears in many farming areas, and in many cases the individual farmer cultivates both types of land

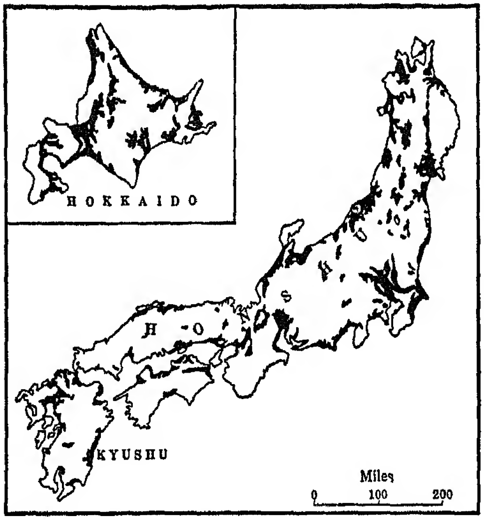
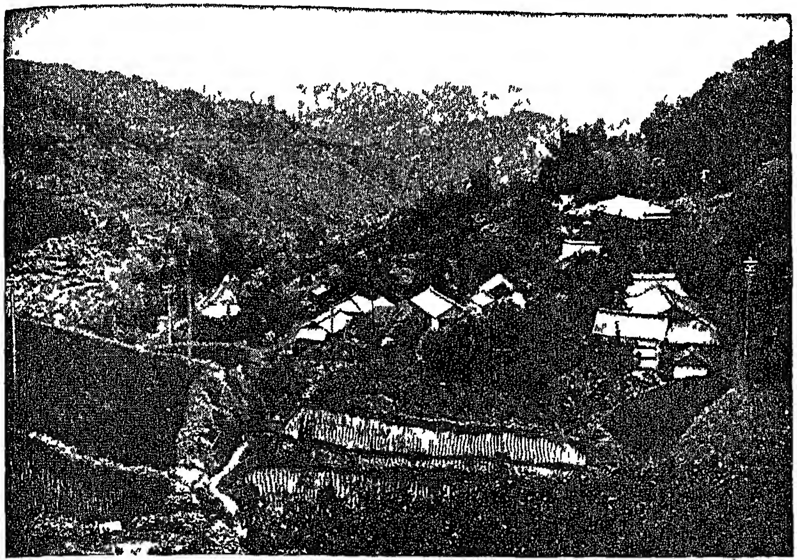


FIG 305 Major agricultural areas of Japan

Major food crops Rice is the principal food crop of Japan and is grown on more than half the cultivated land of the country This means that rice is relatively more significant in Japan than is any single crop in Western Europe or in the United States The yield of rice per acre is larger than that of any other cereal, and thus the crop is well suited to a country where the population tends to outgrow the food supply As Hokkaido's climate is not well suited to rice, rice is an unimportant crop in that island

Of the upland food crops, barley, wheat, soybeans, potatoes, and millet occupy large areas In Hokkaido the climate calls for spring-sown crops, but in the other islands the small grains are sown after the rice, vegetables, or other crops have been harvested This system of two or more crops a year calls for much fertilizer and helps one to understand why many people can live in such small farming areas

Cash crops In addition to the food crops, the mulberry tree and the tea bush are conspicuous in the landscape and highly important in supporting the population The leaves of the mulberry tree are the food for the silkworm, and thus the tree is of great commercial significance Fortunately the mulberry tree and the tea bush occupy land not well suited to rice or other cereals. Tea is the more widespread of the two crops, but silk is more valuable in the export trade.



Burton Holmes from Ewing Galloway

FIG 306 An upland farming area in southern Shikoku In and about the village are rice fields, vegetable gardens, and orchards Located near the sea and in the latitude of South Carolina, this upland area has a climate mild and humid enough for rice, tea, and the mulberry Beyond the cultivated valley may be seen a succession of wooded ridges As compared with the lowlands of Japan, this mountainous section supports a small population

A beautiful estate in southern Japan illustrates the crop arrangement which enables the Japanese to produce cash crops without greatly reducing food production The estate lies at the break between a range of hills and a small lowland. The level land is divided into rice fields by low earthen dikes. The dikes and the lower slopes of the hills are planted to mulberry trees, while tea bushes grow on the middle slope At still higher elevations forests cover the hillsides and yield a supply of charcoal for fuel Thus all the land is utilized. In unirrigated fields mulberry trees in many cases share the land with barley and beans The trees do not hinder the growth of the other crops very much, for they are kept so closely pruned that they cast but little shade (Fig 308)

Silk production The production of silk as a cash crop permits all members of the household to take part in earning the family income. While the men are at work in the fields the women care for the worms, and even the children can help with some of the tasks. The care of

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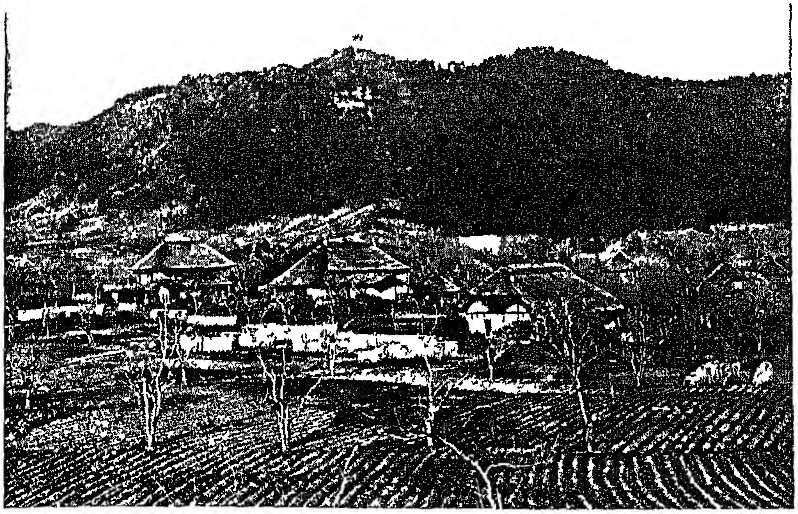
FIG 307 Irrigated rice fields on a small lowland in Japan Because of the heavy rainfall, the damp air, and the wet soil, the rice-growers hang the sheaves of grain on bamboo poles to dry. The area has winters mild and humid enough for autumn-sown wheat and barley In the right center, beyond the first row of sheaves, there is a small patch of ground that has been spaded into ridges for a second crop

the worms occupies the full time of the attendants for several weeks, and if the family raises three annual broods the work extends through nearly half the year (Fig 309) Sorting cocoons employs the women during several of the remaining months

A vast amount of skilled labor is required also for reeling the silk. During the summer and autumn the women and children of the silk-producing districts spend many weeks sorting cocoons, for each pound of silk represents the work of more than 2500 worms Meanwhile the most skillful member of the family sits, day after day, in front of the house, twisting into a single thread the filaments from four or five cocoons and reeling the silk into skeins. Since many manufacturers prefer the fiber which is reeled by machinery, there are several thousand "steam filatures," or reeling mills, in the silk-producing districts of Japan and an increasing number in China.

Down to the Sea for Food. Japan looks to the sea for an important part of its food. Fish mixed with rice or some other cereal is highly

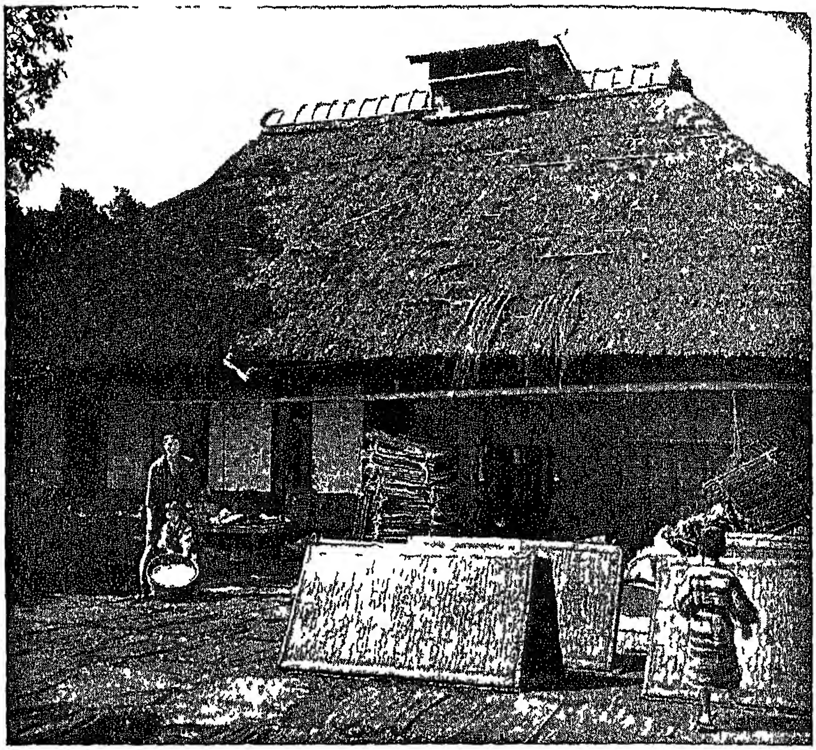


Wellington D Jones

FIG 308 Arrangement of crops on plain and slope in Japan In the foreground, mulberry trees and garden vegetables share the level land, and barley is drying on racks. Beyond the buildings, mulberry trees grow on land too steep for food crops, and the upper slopes are kept in forest

regarded as food, and every village has its fish market. The coastal and offshore waters teem with fish, and along the coasts the small fishing village, with its picturesque fishing vessels, its nets, and its drying seaweed, is a typical feature The fishing industry employs about 1,500,000 people Nearly half of these, however, work in the fisheries on a part-time basis. The fishermen regularly visit the shallow coastal waters, and in summer numerous fishing fleets work north to the rich salmon-fishing grounds off the coast of Kamchatka. The major portion of the catch is sold as fresh fish, but large quantities are salted, dried, or canned for the export trade. Japanese fish are sold as far south as Singapore, and canned Japanese crab meat is widely sold in this country

Mining and Lumbering. Probably less than 300,000 people are employed in the mines of Japan Small quantities of many minerals are obtained, but coal and copper together make up more than 75 per cent of the value of mineral production Coal, the leading mineral, comes mainly from fields in northern Kyushu, with smaller quantities from Hokkaido. Most of the output is low-grade bituminous coal not



Ewing Galloway

FIG 309 A silk-producing establishment near Yokohama The smaller child proudly shows a basket of cocoons that represents a vast amount of work done by the farmer and his family, who grow the mulberry leaves, care for the silkworms, and reel the raw silk from the cocoons (However, many farmers sell their cocoons to filatures in villages or cities) Piled in front of the house are several dozens of the trays on which the silkworms are raised

suited for coking purposes Coal for the blast furnaces is imported from China. The copper deposits of Japan are widely distributed, but the total is sufficient to place Japan in the list of leading copper areas of the world. The reserves of iron ore in Japan are less than the annual consumption in the United States. Petroleum is produced, but the annual output is less than the normal daily production in the United States.

Although more than half its area is wooded, Japan regularly imports lumber, principally from Western United States and Canada It also imports some of the pulpwood and pulp for paper-making and for use in its rapidly growing rayon industry. Most of the lumber

and pulpwood produced in Japan come from the coniferous forests of the sparsely settled northern sections of Hokkaido and Karafuto.

The real significance of the forests in Japan proper is that they provide firewood and charcoal, the two household fuels universally used. These two products come largely from the hilly and mountainous sections. In summer the people of the highlands raise such crops as they can, but in winter they cut wood and burn charcoal and thus add to their income. In recent times the importance of forests as a crop has been recognized, and now planted plots are to be seen in most parts of the country.

"Made in Japan." Purchases of goods marked "Made in Japan" have given people in many countries the idea that Japan is a great industrial nation. Actually Japan is not highly industrialized, though manufacturing, backed both by the government and by the business interests, has increased rapidly in recent years. Most of the Japanese goods sold in other countries are coarse, low-grade textiles or cheap toys and novelties rather than the great staples of commerce. Furthermore, except in the case of cotton-spinning and of some types of machinery, most of Japanese manufacturing is carried on in small workshops rather than in large factories. Japan is, however, the leading manufacturing country in the Orient, and its industries have the advantage of being near a large part of the world's population.

Major Lines of Manufacturing. Textiles rank first among Japanese manufactures, both in value of output and in the number of workers employed (Fig. 310). Textile manufacturing, moreover, is the only line of manufacturing in which Japan ranks among the leading nations. In the production of metals and metal products Japan depends largely upon imported raw materials. Two thirds of the iron ore consumed is imported. In fact, inadequate local supplies of both iron ore and coking coal are one of the big problems confronting Japanese industry. Except for copper, the same holds true for the other metal industries. Consequently Japan imports considerable quantities of pig iron, scrap iron, nickel, tin, aluminum, and other refined or partly refined metals and manufactures them into a great variety of finished metal goods.

In recent years Japan has increased its production of textile machinery, chemical apparatus, structural machinery, printing machines, and machine tools to the point where it is supplying most of its needs and exporting some to other countries. In the chemical industries, Japan

Industry	Per Cent of the Total Value of Manufacturing
Textiles	30 9
Metals and metal products	17 4
Chemicals fertilizers etc	16 7
Machinery and vehicles	13 5
Foodstuffs	10 8
Clay products	2 6
Lumber and wood products	2 3
Printing and binding	2 1
By products of gas and electric plants	2
Other industries	3 5
Grand total	100 0

Fig 310 Manufacturing in Japanese factories which employ more than five persons each

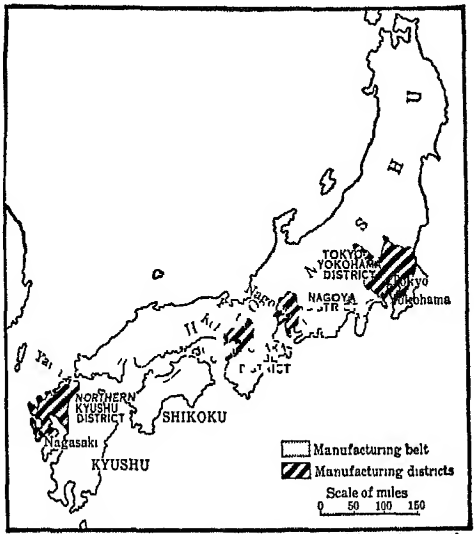
emphasizes the production of fertilizer to increase the fertility of its soils, and also the production of soda ash, caustic soda, and other chemicals needed in the rayon, paper, glass, and rubber industries It also is experimenting with the production of substitute motor fuels such as alcohol and synthetic gasoline

In world markets Japan's pottery and porcelains have been well known for many years. In fact, pottery manufacture in the homes or in small kilns is one of the oldest lines of manufacture in Japan More recently the industry has developed in Nagoya on a factory basis, and cheap and medium-priced Japanese tableware is sold in many parts of the world. The United States is the leading customer and commonly takes over a third of Japan's pottery exports

Predominance of Small Factories and Workshops. Figure 310 does not present the whole picture, for much of Japanese manufacturing is done in cottage workshops where part-time workers turn out toys, chinaware, wood products, hosiery, or other goods in everyday use. According to the Japanese census, 65 per cent of Japan's industrial workers are employed in shops employing fewer than four persons each In the United States, in contrast, 80 per cent of our factory wage-earners are employed in factories with 50 or more workers.

The Japanese workshops are small, primitive, one-story buildings of wood and corrugated iron. Practically all of them are equipped with an electric motor, and the individual shop has benches, tools, lathes, looms, or machines as needed in the production of the articles which the shop turns out. In many cases the workshops and small

factories act as feeders for the large factories A large typewriter, phonograph, or airplane factory, for example, may obtain parts for its machines from several small establishments. In some cases the larger factory even furnishes the materials, the designs, and the machinery on credit Pottery-manufacturers may send plates or other articles out to home workshops to be decorated before being fired in factory kilns In many cases the output of several small shops is sold by a large manufacturing concern along with its own products



Adapted from Trewartha

FIG 311 Japanese manufacturing districts

The success of the small workshop and factory depends not only upon the desperate need of the farmers for part-time work, but upon the widespread distribution of cheap electrical power. Every Japanese hamlet is lighted by electricity, and all but 20,000 of the 11,000,000 homes are equipped with electric lights Thus rural families can use their spare time running a motor-driven machine in a near-by workshop or factory This cheap and dependable power is generated along the many short and swift streams which drain the rainy mountain areas

Manufacturing Districts. Most of Japanese manufacturing is carried on in a narrow belt extending from Tokyo to Nagasaki (Fig 311). This belt faces the Pacific Ocean, is the most densely peopled section of the country, and contains the major cities

Four districts are of special importance The *Osaka-Kobe District* ranks first in output and is the leading textile section. The *Tokyo-Yokohama District* leads in the variety of its manufactures, producing textiles, goods made from iron and steel, and electrical apparatus It also contains the major shipyards. The *Nagoya District* specializes in silk and other textiles and ranks third in importance among the manufacturing districts. The *Northern Kyushu District* emphasizes

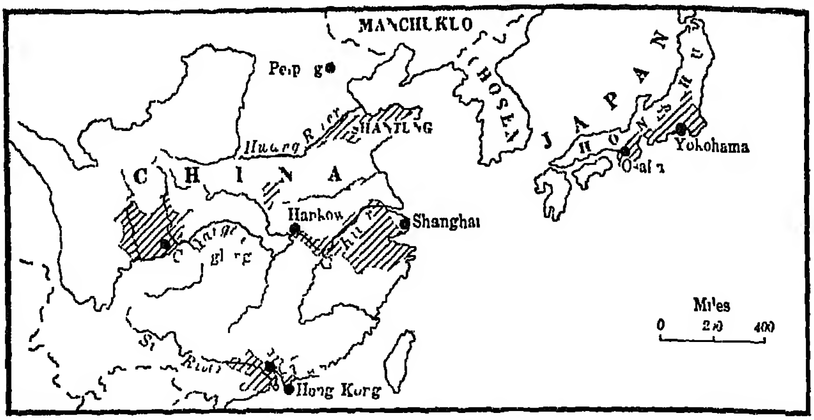


Fig 312 Principal silk-producing districts of Eastern Asia are shown by ruling

the heavy industries, more especially iron and steel and cement In these industries it is favored by being alongside the leading coal field of the country. In addition to these major manufacturing districts, there is a silk-reeling area in the mountainous center of Honshu which produces half of Japan's raw silk

The Silk Industry. Silk is the most famous Japanese product, and the silk industry is the one great enterprise based on domestic raw materials The manufacturing of silk is made up of three processes· reeling, spinning, and weaving Of the three, reeling is the most important because it employs more laborers than any other manufacturing activity and because much of the silk is shipped abroad before being made into thread or cloth. Silk-spinning and silk-weaving, however, are ancient Japanese arts, and large quantities of silk goods are produced for the home market and for export.

Major markets For many years silk has figured prominently in the export trade of both Japan and China. The United States is the principal market, for it manufactures half the silk of commerce In fact, about 85 per cent of Japanese export silk finds its way to our mills. Western Europe also draws much of its silk supply from Eastern Asia The trade between Eastern Asia and the United States is so large, however, that it dwarfs other divisions of the raw-silk trade. The only other important source of raw silk is the Mediterranean Region, with Italy as the largest producer.

Silk-producing areas of Eastern Asia Eastern Asia has five major silk-producing areas widely separated from one another The area

of largest output lies west and north of Yokohama (Fig. 312) China contains the other four areas, namely, (1) the delta of which Canton is the commercial center, (2) the delta and lower valley of the Yangtze, (3) the Chungking section of the Yangtze Valley, and (4) the peninsula of Shantung Each of these areas has a dense population and a climate which favors the production of a leaf crop to feed the silkworms. In each of them, moreover, the people have had long experience in raising the worms and in producing the finished goods

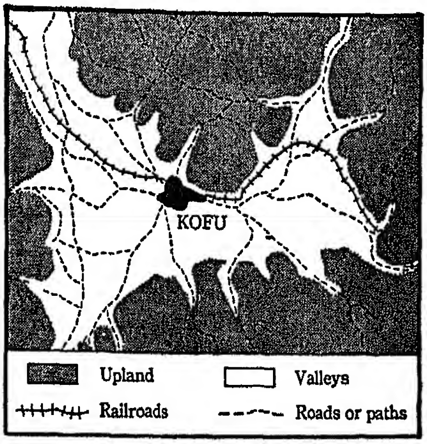


FIG. 313 Kofu, a filature center in the hill country of Japan

Industry organized for export In producing silk the Japanese endeavor to satisfy the demands of the export market, especially the American market. Exporters, dealers, and filatures form connecting links between the Japanese farmers and the American manufacturers. The exporters are Japanese companies in most cases, with offices in both Yokohama and New York The men in New York keep their associates in Yokohama informed as to what the manufacturers want Exporters and dealers pass the information on to the filatures from which they buy Many of the filatures are located in market towns at the junction of several silk-producing valleys (Fig 313), and thus have direct contact with the families producing silk within a considerable area. The biggest filatures look like large factories, but smaller ones are more typical Such filatures not only purchase cocoons from the farmers but also supervise production methods in their districts. By distributing eggs to the farmers, they make sure the breed of worms is one which will produce silk fiber suited to the demands of the American market

Transpacific shipments In crossing the Pacific, the silk travels on fast passenger-cargo vessels following the short northern route rather than the longer one via the Hawaiian Islands (Fig 296) Time is important in shipping silk, for every additional day on the way adds expense in the form of insurance and interest on investment Most of

the silk is sent to New York, the silk-manufacturing and commercial center of the United States Some of the raw silk enters via our Pacific ports and then moves by fast trains to New York City, but the greater part is shipped by the Panama Canal and enters directly at the port of New York

Competition with rayon In the New York market (and in the world's markets) silk competes with cotton, wool, and rayon In total quantity silk is a poor fourth, for of the more than 18 billion pounds of these four textiles produced in a recent year, 81 per cent was cotton, 12 per cent wool, 7 per cent rayon, and less than 1 per cent silk

For many purposes silk competes directly with rayon, the textile product of the chemical age The working principle under which rayon is produced goes back to the habits of the silkworm In the silkworm's body, cellulose from mulberry leaves is changed into silk, and rayon's basic material is cellulose derived from a combination of cotton linters and wood pulp In liquid form the cellulose is forced through a nozzle, much as the silkworm forces its glandular secretion through its spinneret The fine filament spun by the silkworm hardens in the air, whereas rayon filaments need a chemical bath The major uses of the two fibers are not identical In some cases rayon and silk are mixed, but increasingly silk is employed in the luxury or special-service trades For hosiery and for other uses where strength, elasticity, softness, and beauty are demanded, silk has no equal In silk production Japan and China do not face serious competition with other parts of the world, but their silk industry is threatened by their own rapidly growing rayon production as well as by that of the United States and Western Europe

Cotton-Manufacturing. Cotton-manufacturing is probably the largest and best-organized industry in Japan About 70 per cent of the output comes from large modern factories. Japan ranks third among the nations in the number of cotton spindles, and it rivals the United Kingdom in cotton-goods exports The output of each of these countries is less than that of the United States, but as most of our goods are sold in the home market, both Japan and the United Kingdom are larger exporters. Japan specializes in coarse, cheap cotton yarn and cloth Take away these cheap grades, and there would be little left of Japan's cotton industry Japan's function is to supply cheap goods to the poor people of Asia—there are hundreds of millions of such people

Location of the cotton mills Most of the cotton-spinning and much of the weaving and finishing are carried on in the major manufacturing districts of southern Honshu Large, well-equipped mills in or near the big cities do most of the spinning Weaving is more widely distributed, much of it being done in small weaving sheds. The finishing and dyeing are done chiefly in small plants and in some cases by hand methods In many cases the cloth is bleached outdoors, and an open space with yards and yards of cloth exposed to the sun on tall sticks or frames is a characteristic sight in the textile centers

Success of the industry Cotton-manufacturing in Japan illustrates the importance of position, power, labor, capital, and organization In each of these respects Japan has some measure of advantage

Because of their seaboard position the principal cotton mills are in or close to the ports where the imported raw cotton is unloaded and from which the finished goods are exported In this respect Japan resembles Lancashire and New England rather than our South

Electricity is the type of power best suited to cotton-spinning and cotton-weaving Japan is well equipped in this respect for electricity is produced cheaply from its numerous streams, and a system of power lines carries power to all thickly settled parts of the country

Labor is cheap This factor appears to be the most important one Its basis is the extreme poverty of the Japanese farmers In spite of the utmost frugality, the farmer gets in debt To discharge the debt the daughters or sons of the family are sent to the spinning mills or weaving sheds In some cases the farmer receives an advance sum for his daughter's work—in other words, he collects most of her wages At the mills the girls are housed in dormitories where food and lodging are provided The work is hard, and after a year or two, if the debt is paid, the girls return to their homes or seek other jobs They are replaced by the never-ending supply occasioned by the poverty of the farmers and the ever-increasing population of the islands.

Capital for enlarging the industry came from the great profits made by the Japanese mills during and after the World War At that time the European mills could not supply the Oriental markets, and the Japanese industry expanded rapidly to care for the business The companies used a part of their profits to build new and larger mills, to install up-to-date machinery, and to some extent to improve working conditions in the mills This wartime impetus was something like that which started cotton manufacture in New England during

the early nineteenth century (p 281). Wars certainly have been costly for the European textile industries.

The Japanese textile industry, like most Japanese industries, is in the hands of a few big, powerful companies. These companies import most of the raw cotton and do most of the manufacturing Every effort is made to keep down costs and to increase output For sales in Eastern Asia they maintain well-established agencies and have close working arrangements with the shipping companies Such arrangements are facilitated by the fact that about fifteen families control more than 70 per cent of the banks, factories, big stores, railroads, and ships of the country Nothing like this exists in any of the other great textile-manufacturing areas By means of their efficient organization and their nearness to China, Manchukuo, and the Philippines, these Japanese companies can deliver goods in East Asian markets in from 10 days to three weeks In contrast, three months are needed for delivery of goods from Great Britain or the United States.

QUESTIONS

1 Give facts to illustrate the statement that Japan is both old and new Is the new found chiefly in cities or rural areas?

2 Where are Japan's best farmlands? Judging from their location, how are they probably related to rivers?

3 What is Japan's principal food grain? Why is this grain well suited to a crowded area? Does it require much or little water while growing (Fig 307)?

4 What is Japan's most valuable export? In what way does chemical manufacture threaten the trade in this commodity?

5 How does Japan's food supply depend upon shallow seas (p 9)? Why are friendly relations with the Soviet Union desirable for the success of Japan's fisheries?

6 What are Japan's principal mineral resources? What is its most plentiful power resource?

7 In what line of trade is Japan a strong competitor of Britain? Where in Japan are the principal districts manufacturing for this trade? What countries probably furnish raw material for the industry (pp 270–271 and Fig 154)? What power does the industry use? Where is the output sold?

8 How are the prices of Japanese exports related to Japan's population density? to its developed power resources?

EXERCISES

1 *Silk and the silk trade*

Outline a talk on this subject after answering the questions below

1. Where are the six major silk-producing districts of the world? How many of them are in Asia? What other continent produces raw silk?
2. Which silk-producing districts are near the coast? Which are far inland?
3. What river probably carries much silk to an exporting port? To what port?
4. Which of the silk-producing districts have dense populations? What difference does population density make?
5. In a recent year the raw silk of international trade amounted to about 43,000 tons Of this amount the United States imported 30,000 tons What region probably took most of the rest?
6. In the same year our imports from three countries were as follows (*a*) 27,842 tons, (*b*) 1233 tons, (*c*) 1082 tons. What are these countries?
7. Imports of raw silk into one of our ports in that year amounted to more than 24,000 tons Which port was this?
8. In the following year 31,000 tons of unmanufactured silk passed through the Panama Canal Did the silk probably move from the Pacific to the Atlantic or from the Atlantic to the Pacific? How do you know?

2 *Manufacturing in Japan*

Bring together your ideas of the New Japan, considering these points

a Importance of Japanese manufacture
- (1) How does Japan compare with Britain and France in manufacture?
- (2) How does manufacturing compare with agriculture in the number of Japanese workers employed?
- (3) What is Japan's rank among steel-manufacturing countries (Exercise 2, Chapter XXIX)?

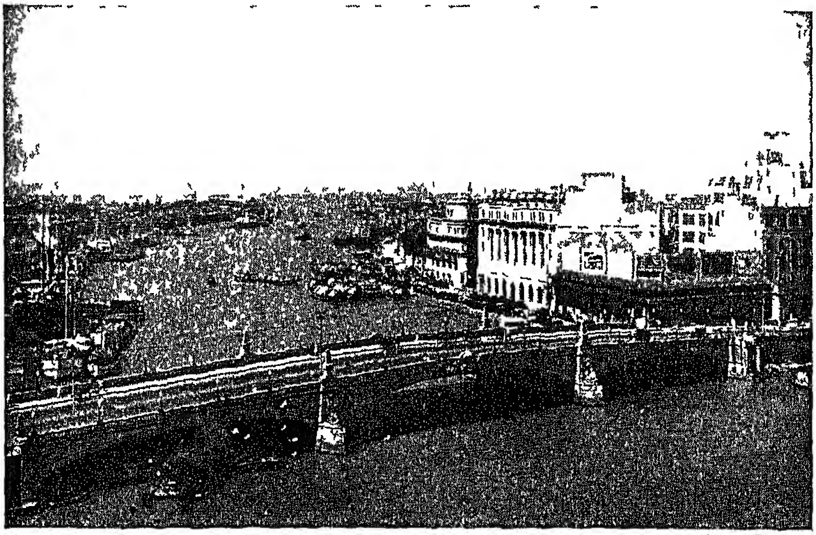
b Location of manufacturing districts (Fig 311)
- (1) On which islands are the principal manufacturing districts?
- (2) Describe the location of these districts with reference to coasts and the Inland Sea, with reference to important agricultural lowlands

c Lines of manufacture
- (1) What Japanese products go into the export trade from rather large-scale factories? Which still come typically from small plants?
- (2) Which of the principal districts are interested in textile manufacture? Discuss the locations of these districts with reference to the problem of getting imported materials, with reference to a supply of electric power from the mountains, with reference to labor supply
- (3) Which district is responsible for most of the steel manufactured in Japan? What advantages has this district for heavy manufacturing?

CHAPTER XXXIX

THE PHILIPPINE ISLANDS AND THEIR PLACE IN THE COMMERCIAL WORLD

The Philippines: Oriental Outpost of the United States. The Philippine Archipelago is the most distant territory under the American



Ewing Galloway

FIG 314 The Manila water front along the Pasig River In harmony with Manila's importance as an entrepôt the river is thronged with river craft, inter-island steamers, and ocean-going vessels The long, low, matting-covered river boats betray the Oriental setting of the port, while the big new buildings bespeak the influence of the Occident

flag. Since acquiring these islands from Spain in 1898 the United States has had an ever-increasing interest in their commerce Even though Manila is halfway round the world from New York, we are today the largest customer of the Philippines, and they buy more from us than from any other country

Relations with Eastern Asia. In position the Philippines bear much the same relation to China and Japan as Cuba and the other West Indies do to Eastern United States. The Philippines are tropical islands, and China and Japan are their nearest middle-latitude markets. Here, then, is a logical climatic basis for trade, and trade between China and the Philippines was in existence long before Magellan discovered the islands in 1521.

Relation to Trade Routes. The Philippine Islands are well placed with relation to world trade routes (Figs. 28 and 296) The northern end of the archipelago lies only 400 miles off the coast of China, and all shipping employed along this coast must pass within calling distance of Manila on the northern island As a result, Manila is a port of call for practically all ships plying between India and Eastern Asia, and also for ships sailing from Europe via Suez for Shanghai and Yokohama For much of the shipping employed on the North Pacific Route Manila is the western terminal, and ships that offer round-the-world services call there

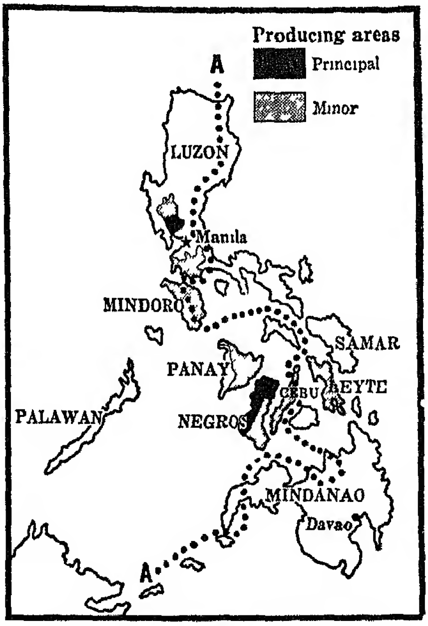
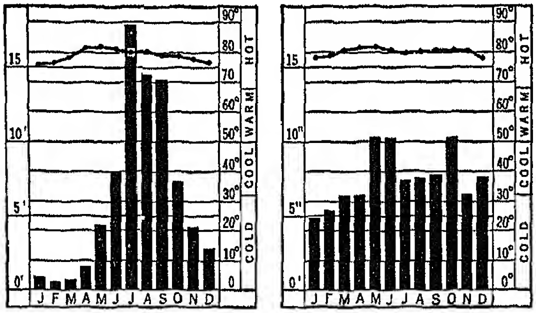


FIG 315 Sugar cane in the Philippines West of A–A there is a dry season

Manila and the Archipelago. Manila, at the southwest corner of the island of Luzon, is the leading commercial center of the Philippines (Fig 314). It not only commands the trade of the productive island on which it is located but serves as a center of collection and distribution for the other islands Small inter-island steamers provide regular services between Manila and ports on the other islands, thus giving the more productive parts of the archipelago ready access to the major port

Agriculture the Leading Industry. Agriculture is the principal industry of the Philippines. Approximately 15 per cent of the total land area is under cultivation, and probably three times that amount is suitable for cultivation The islands are of volcanic origin, and in the interior of even the larger islands there are considerable areas of hilly or mountainous land that support few people and contribute but little to commerce. Vegetables and corn for human food are grown to some extent in most of the agricultural districts, but rice is the staple food grain and occupies more land than any other crop The home-

grown rice crop usually is not enough to supply the large demand, and rice is imported, the amount depending on the size of the Philippine crop.



MANILA
Elevation above sea level, 20 feet
Average annual rainfall, 77 4 inches

DAVAO
Elevation above sea level, 20 feet
Average annual rainfall 90 3 inches

FIG 316 Temperature and precipitation at Manila and Davao

Philippine agriculture produces for export as well as for local consumption Sugar cane, coconuts, abacá, and tobacco are by far the most important export crops Each of these crops is grown on several of the islands The principal areas producing sugar (Fig 315) and tobacco lie in the western and northern parts of the archipelago, where there is a distinct dry season (Fig 316) Abacá comes largely from the eastern islands, which have little or no dry season (Figs 317 and 316) The coconut grows along the coasts of many of the islands, but commercial production is most important along the humid coasts in the eastern part of the archipelago

Abacá the Distinctive Crop. Although abacá is not the leading crop either in acreage or in amount of export, it is the most distinctive of the Philippine products, for it is not grown commercially outside of the archipelago Abacá is so closely associated with the Philippines that it takes its commercial name, "Manila hemp," from the name of the port through which it long has been shipped

What abacá means to industry and transportation Manila hemp is the most valuable of cordage fibers and sells in the markets of the world because of high quality. It is stronger, longer, lighter, and more durable than any other fiber used in making ropes. It costs more than other cordage fibers, but is widely used where quality is important. Thus, if a contractor buys rope for the cranes which lift heavy pieces of structural steel into place in the framework of a skyscraper, he is apt to choose Manila hemp, for he cannot afford to run the risk of an accident Manila rope, because it stands frequent wetting with rain or sea water better than do other cordage fibers, proves extremely satisfactory for the rigging of ships and for the great hawsers which

moor large vessels to the docks Consequently the United Kingdom, the leading shipbuilding nation, long has been a large buyer of Manila hemp. The United States, however, is the largest consumer, Japan ranks second, and the United Kingdom third.

The plant and its local uses Abacá resembles the banana plant and grows in the same humid tropical environment The stalk contains the fiber, which may be 6 or 8 feet long (Fig 318) The plant was grown first for home use The people found it growing wild in their forests and began cultivating it for its fiber Fabrics made from this fiber vary from heavy burlap-like materials suitable for rice bags to gauzy cloth in which fine, soft abacá fibers are combined with silk Many of the natives wear abacá slippers, and hats of abacá fiber rival the famous Panama hats These products are made by hand in the abacá-producing districts and are sold through Manila to other parts of the archipelago

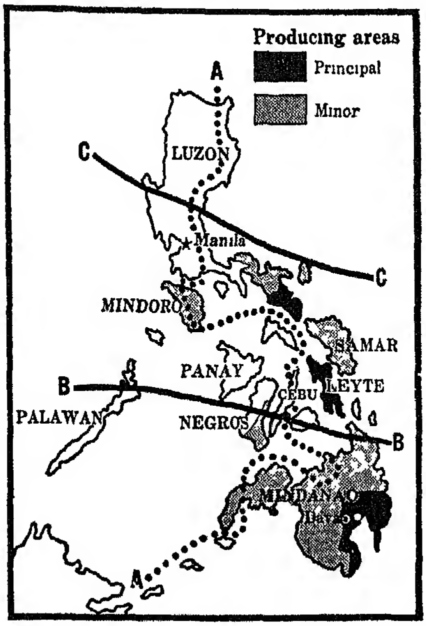


Fig 317 Abacá culture East of line A–A, there is no dry season The area south of B–B is free from tropical cyclones (typhoons) North of C–C, typhoons are frequent Between B–B and C–C there are occasional typhoons

Promising Crops for Future Development. New commercial crops, such as rubber, cacao, and sisal, have been introduced into the Philippines in recent years, and coffee formerly was of some importance. Considerable areas in the southern islands have a climate suited to rubber production, and rubber culture probably would have been started had it been possible under Philippine law to gain control of the large land holdings required for rubber plantations If rubber, coffee, and cacao ever become important, the industries probably will be financed by outside capital These tree crops yield no returns for several years after planting. The Filipino, with only a small farm and no capital, cannot afford to raise such long-term crops.

FIG 318 Drying abacá fiber (Manila hemp) Note the length of the fibers, which are obtained from the stems of the huge leaves As in the banana plant, the leaf stems are packed in a tight bundle that looks somewhat like the trunk of a palm tree The first harvest takes place two or three years after planting, and harvest involves cutting down the whole plant

Commercial Relations with the United States. The Philippines trade primarily with the United States and secondarily with Japan and China and Western Europe They customarily buy more than 60 per cent of their imports from the United States and sell about 80 per cent of their exports in American markets (Fig 319) Japan is the second-best customer, taking 7 per cent of their exports and supplying 13 per cent of their imports. Trade between the Philippines and the United States developed rapidly during the period from 1913 to 1934, when Philippine products entered our country without paying duties Under the present plan, however, the Philippine Islands will become in time an independent commonwealth, and their products will no longer be admitted free to our markets Duties are to be imposed gradually, so that Philippine commerce may not suffer unduly.

Four commercial crops—sugar, coconuts, abacá, and tobacco—

Principal Exports	Value in Million Pesos	Per Cent to United States	Principal Imports	Value in Million Pesos	Per Cent from United States
Sugar	124	99	Iron and steel and manufactures of them[4]	32	77
Coconut products	71	79	Cotton goods[5]	31	44
Abacá[1]	34	31	Petroleum products	15	85
Gold bullion	20	100	Automotive products	11	99
Tobacco and products[2]	11	49	Meat and dairy products[6]	11	38
Embroideries	9	100	Wheat flour[7]	8	10
Lumber[3]	6	39	Tobacco products	7	99
			Paper and manufactures of them	6	72
Total exports	295	80	Total imports	202	61

FIG 319 Principal exports and imports of the Philippine Islands in a typical year and the percentages to and from the United States

yield more than 80 per cent of Philippine exports As the United States is the principal market for all of them, it is easy to understand why the Philippine businessmen and farmers are always interested in conditions in this country Exports of tobacco to the United States consist largely of cigars, whereas Spain buys leaf tobacco, much of which comes from plantations owned by people of Spanish descent The high prices paid by the United States for gold during recent years have led to increased interest in gold-mining. In fact, the Philippines now produce more gold than Alaska and more than any of our states except California Making embroidery for export concerns a large number of families When the World War cut off European supplies, American merchants encouraged the native Philippine women to capitalize their skill in needlework. As a result, an important household industry has come into existence

Imports into the tropical Philippines consist mainly of middle-latitude goods, particularly manufactures Cotton goods and iron and

[1] To Japan, 28 per cent, to United Kingdom, 22 per cent.
[2] To Spain, 28 per cent
[3] To Japan, 37 per cent.
[4] From Germany, 7 per cent, from Japan, 6 per cent
[5] From Japan, 36 per cent, from United Kingdom, 6 per cent
[6] From Netherlands, 37 per cent, from Australia, 14 per cent
[7] From Australia, 32 per cent, from Canada, 21 per cent

steel and their products (especially machinery and corrugated roofing) are the leading import groups Together they make up more than 30 per cent of the import trade. Mineral oils come next. The use of kerosene is so widespread that in the rural districts the 5-gallon tin kerosene can has become an accepted unit of measure Moreover, with the rapid increase in the imports of automobiles in recent years, imports of gasoline and lubricating oils have increased accordingly. The presence of American residents in the Philippines leads to a growing demand for wheat, flour, meat, dairy products, cigarettes, and other American goods to which these people were accustomed at home Taste and familiarity are important factors in trade.

QUESTIONS

1 What four agricultural products rank high among the exports of the Philippine Islands (Fig 319)? What mineral product? What forest product?

2 Do Philippine lumber exports consist chiefly of hardwood for furniture and interior finishing or of softwoods for construction purposes (Fig 24 and page 40)?

3 What major agricultural export also ranks high among exports from the United States (Fig 30)? Which one is a specialty grown only in the Philippines?

4 From how many countries do the Philippines buy more than they buy from the United States (Fig 319)? To how many countries do they sell more than to the United States?

5. Is our trade with the Philippines helped or hindered by political ties? Explain Is it helped or hindered by climate? Explain

6 Why is it logical for the Philippines to trade with Japan and China? (Consider the bearing of location, climatic contrasts, and established trade connections)

7. What part does Manila take in the trade of the Philippines? How does it happen that there are frequent opportunities for sending mail or shipping freight by sea from Manila? How are products from the other islands brought to Manila for export?

8 What part of the Philippine Islands probably produces bananas for local use (Figs 317, 316, and 42)? Give reasons for your opinion Why should this section not produce bananas on a large scale for shipment to the United States?

9 Why does the United States, itself a large exporter of tobacco, buy tobacco from the Philippines (pp 297–299)?

10 The abacá plant has very large leaves and very short roots What bearing may these characteristics have on its ability to withstand periods of drought? on its suitability for a windy site?

EXERCISES

1 *Abacá, a Philippine specialty*

Make an outline for a report on this subject (either oral or written) Before starting the outline, bring together your knowledge and ideas by considering the points listed below

a Account for the name "Manila hemp," applied commercially in spite of the fact that abacá is not a hemp and is not grown on a large scale within 100 miles of Manila (Fig 317)

b Reason for calling abacá a cordage fiber rather than a textile fiber, its principal uses, qualities that make it better than other fibers for these uses

c Comparison with cotton as to (1) part of plant from which fiber is obtained and (2) length of fiber (very little of the world's cotton crop consists of fibers more than one and three quarters inches long)

d Comparison with flax fiber as to (1) size of plant from which fiber is obtained (Fig 293), (2) method of harvesting, (3) process of extracting fiber, and (4) climate of producing areas

e Location of principal abacá-producing areas (Fig 317) and reasons why the crop is not suited to areas with frost (reasons based on similarity to the banana, p 87)

f Which probably is better suited to abacá culture, the climate of Manila or that of Davao (Figs 316 and 42)? Why is abacá culture not important in the western islands (Fig 317)? in the northern part of Luzon?

2 *The Philippines and the world's sugar supply*

Make a study of the sugar industry and trade of the Philippine Islands according to the following outline

a The Philippine sugar crop (Fig 48)
- (1) Plant grown for sugar—cane, beet, or both
- (2) Relation of this fact to climate (p 99)
- (3) Rank of Philippines among sugar-producing countries of the Orient
- (4) Comparison of Philippine sugar crop with that of the United States

b Philippine sugar districts (Fig 315)
- (1) Part of archipelago interested in sugar—eastern or western islands
- (2) Contrast with location of abacá producing districts
- (3) Relation of this contrast in location to contrast in climate
- (4) Probable harvest season in Philippine sugar districts—same as in Cuba or about six months later (Figs 56 and 316)

c Philippine sugar trade
- (1) Rank of sugar among Philippine exports (Fig 319)
- (2) Principal market for Philippine sugar
- (3) Effect of political ties on sugar trade (pp 101–102)
- (4) Other producing areas that enjoy same privilege in markets of United States (pp 101–104)
- (5) Effect that Philippine independence may have on the sugar trade

CHAPTER XL

RICE—AN ORIENTAL FOOD AND AN ORIENTAL CROP

Where Rice Is Grown. Rice culture belongs chiefly to the Orient (Fig. 320). The great bulk of the rice crop is grown by Oriental farmers for their own use and thus does not enter commerce. China grows more rice than any other country. India is second, and together these two countries commonly produce two thirds or more of the world's crop. Japan ranks third in rice production but has the highest average yield per acre of all the major rice-growing countries. Java and the peninsula of Indo-China are the other large producing areas. In comparison with the great production of these Oriental areas the rest of the world's rice crop is hardly worth mentioning. A little is grown, however, in many tropical areas, and also in the delta of the Nile, in Northern Italy, and in Texas, Louisiana, and California.

What Areas Engage in Rice Trade. Commerce in rice belongs mainly to three trade regions of the Orient. Most of the world's export rice is grown in the East Indian Trade Region for shipment to consumers in India and Eastern Asia (Fig. 297). The principal exporting countries are Burma, French Indo-China, and Siam (Thailand). Besides shipping to India and Eastern Asia, they sell considerable quantities to other countries within the East Indian Trade Region.

Principal importing countries. Nearly two thirds of the rice of international trade goes to five Oriental areas—Japan, China, India, British Malaya, and the Netherlands Indies. The principal rice-importing countries of Europe are France, Germany, the United Kingdom, and the Netherlands. France is the only European country that imports as much as does British Malaya.

Japan, with its large population and its small area of farm land, ranks first among the rice-importing countries of the Orient. However, Japan does not rank very high as a customer of the East Indian rice-exporters, for it buys chiefly from the Japanese provinces of Chosen and Taiwan, which lie within the East Asian Trade Region. Furthermore, Japan's purchases of East Indian rice consist mainly of broken rice, bought at low prices for sale to customers who cannot afford to pay much for their food.

China imports less rice than Japan, but it ranks first as a buyer of rice from the East Indian Region, since nearly all its imported sup-

ply is obtained from French Indo-China, Siam, and Burma Chinese imports vary greatly from year to year, depending on the size of the domestic crop Imported rice goes principally to ports of South China, where rice is a major crop and a staple food This division of China contains nearly two thirds of the entire population, and three of its major ports together have a population of nearly 6 million To these great cities and to other cities of the coastal belt, rice moves from irrigated districts of China as well as from abroad

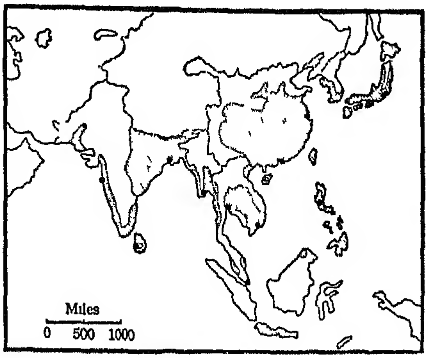


FIG 320 Where rice is grown in the Orient

India ranks third among rice-importing countries, though it raises more rice than the whole East Indian Region Its trade reflects the influence of distance and of political ties It buys almost wholly from Burma, which is the nearest of the rice-exporting countries, and which, like India, belongs to the British Empire It exports some of the imported rice to Ceylon and other Empire countries that contain a good many people from India

In the East Indian Region, rice moves principally to districts which produce rubber, tin, gold, or some other commodity for export Sumatra and British Malaya regularly import rice from other countries of the region Java, with a much larger population, produces nearly enough for its needs, but in some years it imports rice

Three rice-exporting deltas The export rice of the East Indian Region comes mainly from the peninsula of Indo-China, one of the less densely peopled parts of the Orient It is grown on three great deltas, which together make up less than a sixth of the total area of the peninsula (Fig 321) The rice industry, however, is so important that each delta is the heart of the country in which it is located Thus the delta plain of the Irrawaddy River contains more than a third of the population of Burma, the delta of the Menam River is the richest and most densely populated portion of Siam, and the delta of the Mekong River makes up the most productive part of French Indo-China.

What the Rice Lands Are Like. The rice-producing deltas of Indo-China are among the rich agricultural lands of the world They are as flat as Holland or Louisiana and as fertile as the valley of the Nile They are made up of alluvial material so fine that one might walk all day in the fields and never find a patch of gravelly or stony soil Natural levees border the streams (p 92), and most of the villages are on the natural levees The palm-thatched bamboo houses are set up on poles from 5 to 15 feet above the ground. Every house has its boat, and the streams are the principal highways Men, women, and children are skilled boatmen, and everyone knows how to swim

Why Rice Is a Suitable Crop for the Indo-Chinese Deltas. Rice is the crop which makes life possible on these deltas, where drought and flood alternate It gives a large yield per acre, the straw is useful for fodder, and rice grows under conditions which almost no other food crop could endure Annual floods renew the fertility of the soil, and the intense tropical sunshine stimulates the crop to rapid growth. The seeds ripen in about five months from the time of planting

Rice Culture and Nature. The rice farmer's work changes with the change of seasons There is no winter frost in Indo-China, but the drought of the cooler months interrupts the growing season and influences the farmer's work much as does the winter of northern lands. Nature sets the time for sowing and harvest, and if the rice-grower would be successful he must plan his work according to the season.

Preparing the land. Plowing awaits the coming of the first rains, which ordinarily fall in April or May (Fig 322) The poetic Oriental is not content just to begin his farm work when the field is ready To him the season's change is one of the mysteries of nature, and as such it is to be celebrated with a festival. In the rural communities of Siam, a minister who represents the king plows a furrow across the chosen field. He is dressed in robes of state, and the bullocks which he drives are decked out in gay trappings, as befits the occasion Musicians go before him, and with him in merry procession are the village people, clothed in bright-colored holiday garments and carrying banners and paper lanterns. Women follow after the minister, scattering seeds on the freshly turned earth Later the people gather up these seeds and scatter them on their own fields to bring good luck.

Transplanting the rice The rice is sprouted in nurseries and is transplanted to the fields when the plants are about a month old. By

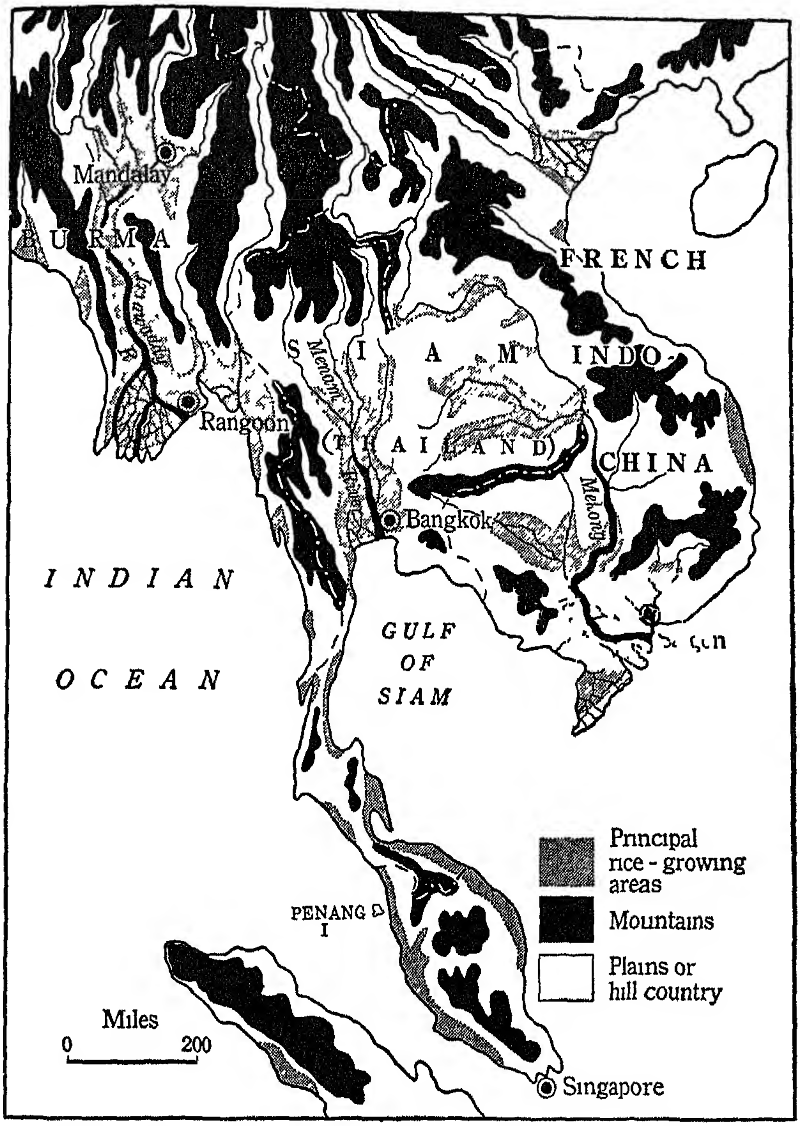


FIG 321 Rice-growing areas in Southeastern Asia (Indo-China) Much of the rice moving in international trade originates on these deltas

that time the streams have overflowed their banks and the fields have been plowed again and again until the soil is worked into a soft, slushy mud The slow-moving water buffaloes which draw the primitive

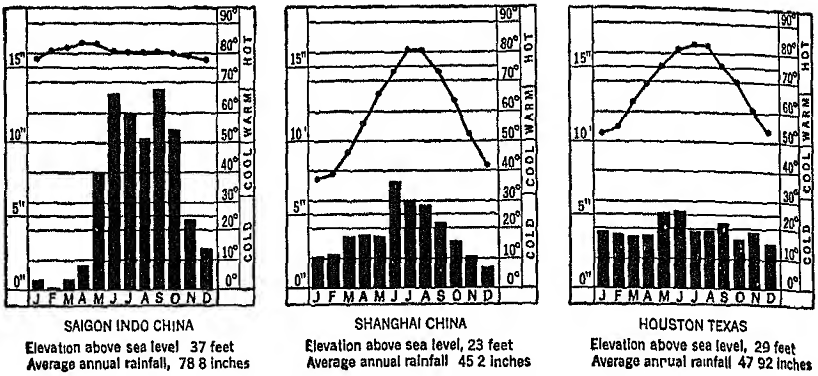


Fig 322 Temperature and precipitation in three rice-growing areas Saigon, Indo China, Shanghai, China, and Houston, Texas

plows become so spattered with mud that they look as brown as the fields. The people wade ankle-deep in the fields to set out the rice plants in the soft mud The young plants, now about a foot high, are ready to make rapid growth Soon the mud and muddy water are hidden beneath a cover of growing rice

Harvesting the crop Harvest takes place in November or December (Fig 323) The work is all done by hand, for modern agricultural machinery is not common in Indo-China, and probably heavy machines could not be used on these soft, muddy plains The grain is cut with a sickle and hung on racks in the field to dry Later it is drawn to the homestead and stacked about the threshing floor. On the lowest fields, where the water stands for weeks after the close of the rainy season, a long-stemmed variety of rice is grown. It is harvested by men in boats, who reach down into the water so as to cut the rice with as long straw as possible When threshing is finished the season's work is ended, and the end, like the beginning, is the occasion for a festival.

Why Fishing Is an Important Industry. While the rice farmer works his land on a one-crop system and does not keep much livestock, he manages to supply his family with animal food The deltas extend into the margin of the sea, and they are cut by a vast system of river channels and canals. Because fish thrive in these waters, fishing is the second great industry of Indo-China. From villages on the shore, as well as from the principal ports, many sailboats go out to fish in the waters off the coast, but vast numbers of fish also are caught

FIG 323 Rice harvest in Siam (Thailand) The delta land is so flat that the palm trees on the natural levee hide the river Even this seemingly level land has been terraced, however, to give an even depth of water on the fields

in the rivers, the canals, and the shallow lakes left by the flood. The fishing industry is largely a secondary interest of the agricultural villages Fresh fish enters to a considerable extent into the diet of the people, but part of the catch is salted or dried. Dried fish is stored for local use in the dry season and is sold to people in the interior of the peninsula. Fishery products also are exported.

Contacts with Outside World. It is chiefly because of the rice trade that the farmers of the Indo-Chinese deltas have business dealings with people outside their own villages During most of the year each village is sufficient unto itself. But after the rice harvest the dependence of the village upon other regions becomes apparent.

First comes the traveling broker, representing a local buyer or a rice mill in the nearest port He comes to bargain for the rice which the farmers do not need for their own use When threshing is finished, the transportation of the grain to market begins On the canals and rivers, hundreds of long, narrow, heavily laden rice boats move seaward, bearing the contribution of the delta lands to the food supply of the world (Fig 324) Part of the export comes from farms at some distance from the water highways, and across the dry fields loaded carts with frail-looking bamboo frames are drawn by slow water buf-

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FIG 324 Rice traffic on Menam River

faloes to the nearest rail or river station There great piles of rice in jute bags await the coming of train or river steamer

After the rice harvest, traveling merchants go up the rivers to the interior of the country They travel on houseboats which have stalls on the upper deck for the display of merchandise When the trading boat is due, the whole village turns out for its annual shopping day Prominent among the stocks of the traveling merchants are Japanese silks, bright-colored cotton piece goods, and cotton yarn Cotton in these two forms makes up the leading item of import in Burma, Siam, and French Indo-China The people of these countries still do some weaving on hand looms, but they buy foreign yarn for their looms because it has brighter colors than they can obtain with native dyes They also prefer the soft, bright Japanese silks rather than the firm and heavy silks which they know how to weave. The income from their rice crops enables them to have their choice in these matters

Rice-Exporting Ports. The export rice, whether it goes by rail or by boat, moves toward the sea, for there are no easy land routes leading across the rough and wild mountain country to the rice-importing areas of India and China Mountains also separate each delta from the others, and consequently each delta has its own port Rangoon, on a distributary of the Irrawaddy, is the port of Burma, Bangkok, 12 miles up one of the Menam distributaries, is the port of Siam, and Saigon is the principal business center and exporting point for the Mekong Delta

Minor Exports. The ships that go to the delta ports for rice find other cargo awaiting shipment A little rubber is produced, pepper

and other spices are grown for export in some localities tributary to the ports, and there is a small export of silk goods, of dried and salt fish, and of tobacco Aside from rice, however, the only export commodity of importance sent from Indo-China into ocean trade is teak, which grows in the mountains of the peninsula Teak is a fine-grained and very durable wood, which is easily worked and takes a high polish It is much in demand in India as material for better-class buildings, for wood-carving, for furniture, and for railroad ties Britain also buys large quantities for certain shipbuilding purposes

QUESTIONS

1 Which grows more rice, Asia or North America? Which consumes more?

2 Three countries produced nearly three fourths of the rice that went into international trade during a recent year What countries, probably, were they?

3 How does it happen that India imports rice from Burma when its own rice crop is more than five times that of Burma?

4 In a recent year, five countries took 80 per cent of all the rice exported in that year What countries probably did this?

5 How do the rice imports of France compare with those of Britain—larger, smaller, or about the same?

6 The following quantities represent Japan's rice crop, its rice exports, and its rice imports in a recent year 28,435 tons, 2,000,000 tons, and 13,748,000 tons Which quantity represents the rice crop? the rice exports?

7 From what areas did Japan probably get most of its imported rice?

8 On what kind of plain is rice grown in Southeastern Asia? What is the origin of the material that makes up these plains (p 92)?

9 Why does the rice-grower of Siam not plow his land in autumn?

10 Compare the time of rice harvest in Southeastern Asia with that of spring wheat in North America Account for the difference

11 What ports ship most of the world's export rice? How is rice brought to these ports?

EXERCISE

World trade in rice—a statistical study

Consult recent issues of the Department of Agriculture Yearbook and prepare a table which will show (1) the principal rice-growing countries, (2) the leading rice-exporting countries, and (3) the principal importers of rice, with the quantity in each case Place a star before the name of each country which is "east of Suez"

CHAPTER XLI

THE RISE OF RUBBER

Youth of the Rubber Industry. As compared with silk, wheat, or steel, rubber is a newcomer in the world of commerce and industry. Waterproof garments have been in use since the middle 1800's, and one rubber company claims that more than 30,000 different articles appear on its sales list. The manufacture of tires, however, consumes the greater part of the annual supply, and not until the day of the automobile did the rubber trade assume big proportions.

During the few decades in which rubber has been on the world's markets, the industry has witnessed three stages in the development of rubber production. At first, practically the whole supply came as a forest product from the Amazon Region, much of it from areas so remote that they never have been explored by white men. Wild rubber could not supply the big demand created by the automobile, and the industry entered the second stage when cultivation began on Oriental plantations previously interested in growing other crops. The third stage was ushered in when big companies opened huge plantations in near-by areas, using land not previously cultivated.

Failure of Wild-Rubber Industry. The decade from 1900 to 1910 witnessed the decline of wild rubber and the rise of the plantation product. Although prices soared, and although there were millions of trees in the Amazon Region, not enough rubber could be secured from the forests to satisfy the growing demand for automobile tires. In the heyday of the forest industry rubber-collectors penetrated into the Amazon country so far that to reach some of the districts required a twenty-day journey from Pará. There was no settled population in these remote districts, and both laborers and supplies had to be brought in. The rubber trees grow scattered through the forest among hundreds of other species, and a collector ordinarily had to travel 5 or 6 miles in visiting the 150 trees which he tapped in a day.

Rise of Rubber Culture in the Tropical Orient. Within a short period of years rubber production moved halfway round the world, and the forest tree became a cultivated crop. Before 1900 a few estate-owners in the Tropical Orient had planted *Hevea braziliensis* (the Brazilian rubber tree) as an experiment, and in 1900 they shipped 4 tons of rubber—an insignificant amount when compared with the

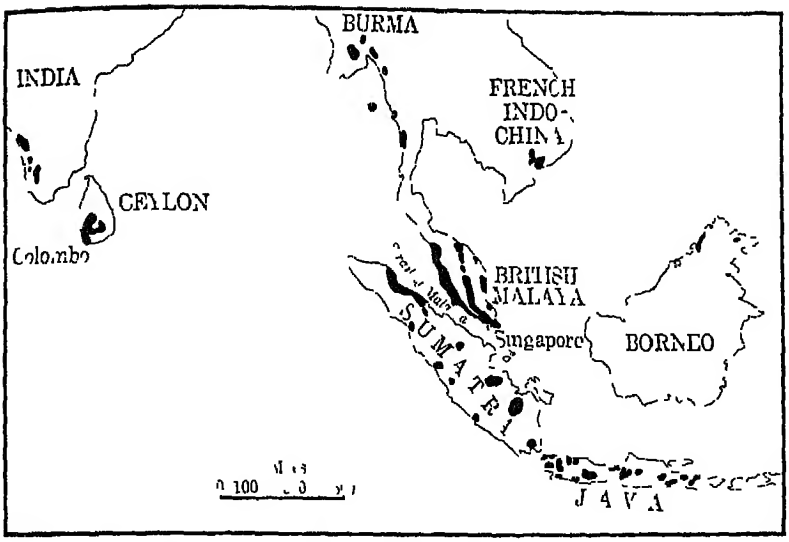


FIG 325 Plantation rubber areas of the Orient

54,000 tons consumed by manufacturers in that year Planters in the Tropical Orient now produce more than 90 per cent of the world's rubber

The principal plantation-rubber area includes the southern part of the Malay Peninsula and the islands of Sumatra and Java (Fig 325) British Malaya alone produces more than 40 per cent of the total. Other small plantation areas are scattered through the Tropical Orient —in Ceylon, southern India, Burma, Siam (Thailand), French Indo-China, and Borneo In addition, small quantities of wild rubber are collected from forests in various parts of the tropical world, the Amazon Basin being by far the largest wild-rubber producer

Why Rubber Culture Developed in the Tropical Orient. One may wonder why, of all places in the world, rubber culture developed in the Tropical Orient The truth is that it was attempted in many places Outside the humid tropics nature decreed failure, because hevea thrives only in a humid tropical environment Many failures occurred, however, in areas where conditions favored the growth of the tree The largest measure of success was attained in the Oriental tropics There the new enterprise was favored by the interest of European nations in their tropical colonies, and by the co-operation of people already engaged in agriculture.

Year	Amazon Region	Tropical Orient	World
	Tons	Tons	Tons
1905	44 000	174	59 000
1910	55 000	7 000	81 000
1915	40 000	114 000	169 000
1920	28,000	305 000	341 000
1925	30 000	567 000	609 000
1930	14 000	802,000	822 000
1935	11 000	855,000	872 000
1938	15 000	863 000	895 000

FIG 326 Growth of rubber production

Interest of European nations If no one had thought of rubber culture until the demand became too great to be satisfied by the wild product, there doubtless would have been a long period of scarcity A start had been made years before by the India Office, a branch of the British government Believing that rubber culture could be established as a profitable industry in British tropical colonies, an agent of the India Office obtained from Brazil, in the 1870's, several thousand seeds of hevea. By planting these seeds and cultivating the young plants on experimental farms in Ceylon, scientists learned much about the habits of hevea and the conditions which favor its growth By 1900 they had in their gardens a stock of mature trees which were producing seeds annually, and they had begun distributing young trees to estate-owners who were willing to experiment with the new crop

Planters welcomed new crop Circumstances had prepared the way for rubber as a new crop in the Oriental tropics, for there were hard times on some of the estates, and planters were wondering what they could do to mend matters In Ceylon, for example, estate after estate was compelled to abandon coffee culture on account of a blight which attacked the trees In Sumatra, low prices for tobacco occurred just at the time when rubber prices were soaring Thus, for one reason or another, rubber took the place of coffee, tobacco, sugar, or cassava on many plantations The planters did not know the details of cultivating hevea, but they did know how to manage a tropical plantation. Their skill and experience contributed much to the success of rubber culture in the early years.

Mr K—'s estate in the eastern part of Java illustrates the services rendered by experienced planters in the early days of rubber culture.

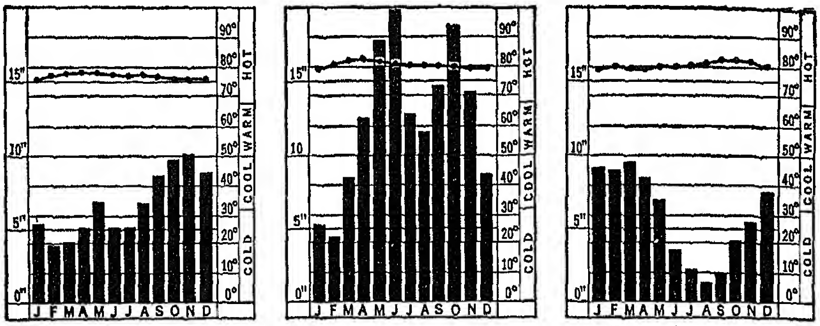
Rubber	4380 acres	Timber	198 acres
Nurseries	9 acres	Bamboo	44 acres
Sisal	959 acres	Buildings and villages	124 acres
Rice	382 acres	Other uses	22 acres
Pasture	7 acres	Total estate	6125 acres

FIG 327 Utilization of land on a rubber estate in Java

This estate was one of the pioneers in the industry and still is a suc cessful producer The estate contains about 6000 acres and is situatec on a well-drained rolling upland about 1000 feet above sea level Coffee formerly was the principal crop, and the change to rubber wa gradual Hevea was planted among the coffee trees, and coffee con tinued to yield an income until the rubber trees reached the tappin age. Then the coffee trees were cut out Mr K— has adopted a cro combination and a system of management well suited to the environ ment of the region (Fig 327) Rubber occupies about two thirds o the total area of the estate Sisal (a plant yielding a cordage fiber) i grown as a secondary cash crop on land not suitable for rubber B keeping a small part of the estate in timber, wood for constructio purposes is provided, and the small area devoted to bamboo furnishe the material which commonly is used for the light framework of th native homes.

The labor force is organized in such a way that the work of th estate moves on without friction European assistants direct the worl of the factory where rubber and sisal are prepared for export The also have general supervision of the work in the groves The laborers however, retain their own tribal organization, work under their ow leaders, and are governed by their own tribal laws They cultivat the rice fields for their own benefit, and obtain a cash income b working in the rubber groves They work as much or as little as the choose and are paid accordingly By accepting the tribal organizatio of his laborers, Mr K— avoids the friction which frequently result from efforts to force upon people the laws and customs of othe nations On estates such as this, rubber culture became establishe and thus prepared the way for the great expansion which occurre in response to the needs of the automobile industry.

Why Tropical Orient Retains Leadership. The third stage of th rubber industry is marked by the active interest of large companie and by expansion into areas which a few years ago were wilderness



MEDAN, N E SUMATRA
Elevation above sea level 82 feet
Average annual rainfall, 80 6 inches

RATNAPURA S W CEYLON
Elevation above sea level 113 feet
Average annual rainfall, 149 6 inches

MANÁOS BRAZIL
Elevation above sea level 148 feet
Average annual rainfall 70 0 inches

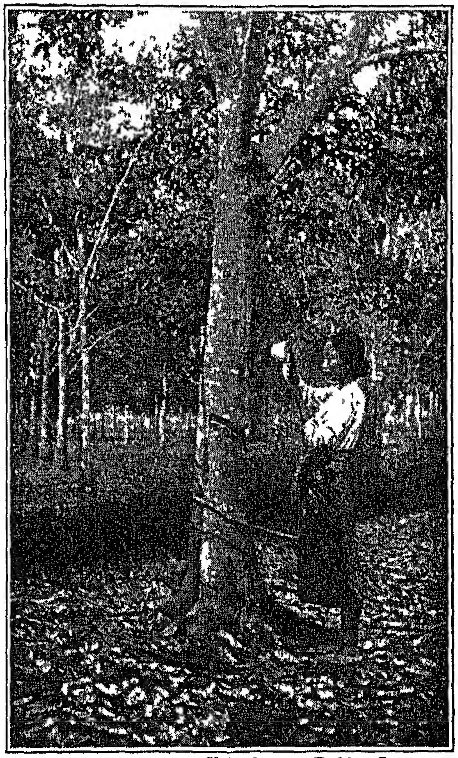
FIG 328 Temperature and precipitation in three rubber-producing areas Medan is in a plantation district of northeastern Sumatra, Ratnapura is in a rubber-growing district of southwestern Ceylon, and Manáos has a central location in the wild-rubber area of the Amazon Basin, the native home of hevea

Most of the newer developments have occurred in the East Indian Trade Region, but one large company has introduced rubber culture into Liberia, in Africa, and another into the Amazon Basin.

Areas of virgin soil available. The plantation rubber industry gained an early foothold in sections of Malaya and Sumatra bordering the Strait of Malacca (Fig 325), where much unoccupied land was available In both Malaya and Sumatra the surface slopes from a central mountain range to a strip of lowland bordering the strait Most of the rubber groves are on the lowland or the neighboring foothills, plantings on the rolling land being the more successful. The soils of the best rubber groves are loams with a large proportion of clay. These soils are deep enough to let the taproot grow downward for 10 or 15 feet, they are loose enough to be well drained, and they hold moisture so well that they do not become dry between rains.

Climate favorable. Although unsatisfactory for middle-latitude people to live in, the climate of Sumatra and Malaya is considered almost ideal for hevea The temperature is high, there is no cool season, and from 60 to 120 inches of rain fall annually, with no long droughts and no long periods of excessive rainfall (Fig 328). This type of climate is admirable for hevea, and thus when the trees are tapped for the first time at the age of five years, they ordinarily have trunks 6 to 7 inches thick (Fig. 329).

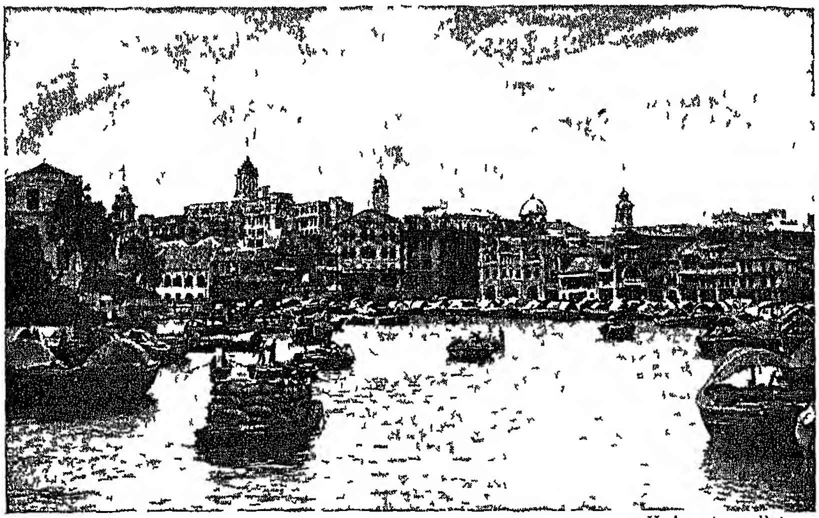
The favorable growing conditions in Sumatra and Malaya affect the profits of the rubber industry in several ways The trees are healthier than in sections where they are exposed to excessive rainfall or long drought and, being healthier, they yield more latex. Because there is little seasonal change, it is the custom in Malaya and Sumatra to tap the trees regularly throughout the year, except for a few weeks during the less rainy season, when the leaves turn scarlet and drop off The long tapping season results in a larger yield of latex, it provides a regular income, and it keeps the labor force employed throughout the year



United States Rubber Company

FIG 329 Measuring latex on a Malaya plantation

Both plantation and native culture Rubber is produced both on large plantations and on the small landholdings of the natives. The major part of the rubber area is owned and managed by European companies, the British controlling by far the largest acreage. Dutch capital is invested chiefly in Sumatra and Java. American companies have entered the field of late, but they control a relatively small area The largest of the Oriental rubber estates, however, is an American-owned plantation in Sumatra. The rubber trees on this estate are numbered in millions, the planted area exceeds the District of Columbia in size, and thousands of people are employed. Approximately a third of the rubber acreage of the Orient is owned by native or Chinese farmers. Most of the native holdings are small, in many cases only about an acre, but a few rank as fair-sized estates. The adoption of rubber culture by the native farmers has added notably to the output of the region.



H Armstrong Roberts

FIG 330 Business section of Singapore from the river The small craft are much used in local trade

Adequate supply of labor One advantage of the East Indian Trade Region for rubber culture is that areas of virgin soil exist near enough to settled areas so that a labor supply is available Sumatra and Malaya both have a settled agricultural population which is fairly dense in some small sections In neither, however, is the population large enough to provide an adequate labor supply for the plantations In Sumatra the lowland natives do not like to work for the white man, but many people in the crowded island of Java are unable to make a comfortable living Consequently, under contracts approved by the Dutch government, Javanese laborers are taken to Sumatra for a year or more of work China and India, with their vast populations, form other sources of labor Ceylon regularly employs laborers from southern India, and Malaya draws from India and China

Singapore and the Rubber Industry. Singapore is the center of the rubber country. The city became famous as a naval post, but it became rich with the rise of the rubber trade The port handles much of the rubber produced in British Malaya and also large quantities from the Netherlands Indies The moist tropical air of the town always carries the stench from the mills which prepare rubber for export The wet sheets from the plantations may contain 25 per cent of water and are not suitable for shipping long distances until they

have been dried artificially. Singapore's merchants and traders buy and sell great quantities of rubber every working day. Singapore newspapers devote much space to news of the industry and to quotations from the New York, London, and local rubber exchanges. Warehouses on or near the water front store rubber until such time as it is shipped to North Atlantic countries. In fact, Singapore holds much the same position in the rubber business that São Paulo and Santos together hold in the coffee trade (Fig. 330).

World's Rubber Trade and Manufacturing. The world's rubber trade has two phases—the trade in crude rubber and the trade in rubber manufactures. The first consists mainly of huge shipments of crude rubber from British Malaya and the Netherlands Indies to the manufacturing sections of Europe and North America. The second consists of the distribution of a great variety of rubber products from the manufacturing areas to all parts of the world. Most of the crude rubber moves via Suez and is carried chiefly in British, Dutch, French, and American vessels.

Eight countries take 90 per cent or more of the crude-rubber output. The United States uses about half the total. The United Kingdom takes about a tenth, and lesser amounts go to Germany, Japan, France, Canada, the Soviet Union, and Italy, in the order named. London is the great rubber market of Europe and the leading importing point. Each of the European countries which manufacture automobiles has one or more rubber-manufacturing centers. The largest single center on the Continent is Clermont-Ferrand, in France.

Most of the crude rubber imported into the United States enters via the port of New York and heads for the major manufacturing belt where most of our rubber-manufacturing establishments are located. The imports come in a steady flow, with about the same amount each month. Five great companies—four in Akron, Ohio, and one in Detroit—dominate the industry. Many other rubber-using plants are located in this Ohio-Michigan section of the Manufacturing Belt. The Eastern Seaboard constitutes the second rubber-manufacturing area, and Los Angeles has introduced rubber manufacture on the Pacific Coast.

The United States exports large quantities of rubber goods. Rubber tires, for example, are a logical part of our big export trade in motor vehicles. Like our exports of automobiles, our rubber goods go to all parts of the Commercial World. More of them find a market

in Canada than in any other country We ship large quantities to Caribbean America, especially to Cuba and Mexico, and to South America, where Brazil and Argentina are our best customers Every country in Western Europe buys some American rubber goods, but the United Kingdom and Sweden buy the most The Union of South Africa and Iran are other countries in which American rubber goods are in demand

QUESTIONS

1. Compare the amount of rubber consumed at present with the amount used in 1905 (Fig 326) What relation is there between transportation and the increased use of rubber?

2 What region produced most of the world's rubber supply in the early 1900's? To what group of industries did the rubber production of that time belong (Fig 5 and pp 10–11)?

3 What region produces most of the world's rubber now? To what group of industries does the present rubber production belong?

4 Is it likely that the rubber-growers of Sumatra ever worry about frost? (Compare Figures 328, 116, and 42 Remember that the Riverside citrus groves must be protected from light frosts in winter, while Limón never has frost)

5 What tropical countries of the Orient are important producers of rubber (Fig 325)?

6 What part did the British government take in getting the rubber industry started?

7 Why did rubber culture begin in an area with well-established agricultural industries rather than in the Amazon Basin?

8 How was rubber production affected in the early days by the misfortunes of tobacco-growers? Where? How was it affected by misfortunes of coffee-growers? Where?

9 What qualities of Malayan soils are favorable for rubber trees?

10 Explain Singapore's relation to the rubber industry In what way is its location better than that of Colombo (Ceylon) for performing these functions?

11 How does the United States rank among the buyers of rubber? Do rubber shipments to the United States probably travel via Suez or over the Pacific? Give reasons for your opinion

12. Why do Sumatra and Malaya import rice?

EXERCISES

1 *World trade in crude rubber*

Prepare a map with this title, using an outline map of the world Choose your own symbols to show (*a*) the principal areas producing rubber and (*b*) the principal areas using rubber for manufacturing purposes, as described on page 607 (The principal German rubber-manufacturing district is near Hamburg) Indicate the one important rubber-shipping port of the Orient and the principal importing ports Then add lines to show the paths of the rubber carrying ships

2 *Factors in rubber production and trade*

State one or more ways in which each of the following features is or has been of importance in the rubber industry climate, drainage, soil, river transportation, native vegetation, government aid, distribution of native population, scientific experimentation

3 *Products of Tropical Orient*

Go back over the commodities discussed in this book and list all those which are produced in the Tropical Orient for export Note, for example, that some products studied under "Tropical America" are also produced in the Oriental tropics.

CHAPTER XLII

THE COCONUT—A PRODUCT OF TROPICAL COASTS

Commerce in Vegetable Oils. Mankind in certain parts of the world long has made use of oils obtained from plants, but within the last few decades vegetable oils and oilseeds have become important commodities of international trade. In 1905 our vegetable-oil import consisted of a little olive oil Now there are more than two dozen varieties of vegetable oil in our import list, and oilseeds also have an important place in our trade

Uses of Vegetable Oils. With the recent growth of the chemical and food industries the demand for vegetable oils has grown enormously (Fig 331) For some purposes, such as soap manufacture, nearly all the commercial vegetable oils are satisfactory. Because they vary in price and the quantity of certain oils is small, not all of them are used in making the soaps widely known in the United States In the manufacture of butter and lard substitutes and other food preparations, perhaps half of the vegetable oils are utilized. Cottonseed, corn, and coconut oils rank high in this respect. For special industrial uses such as the manufacture of paints, only a few of the vegetable oils have been found desirable In the soap, food, and certain other industries, the vegetable oils have to compete with lard, tallow, and other animal fats

Principal Consuming Areas. The four great areas of dense population consume most of the edible oils In the crowded sections of China, Japan, India, and the Mediterranean lands, vegetable oils long have been staple foods, and oilseeds rank among the principal crops of these areas. In commerce the flow of vegetable oils is toward the manufacturing regions of Europe and the United States, the two great world markets for imported foods and raw materials. Western Europe is the larger market of the two, Britain, Germany, France, the Netherlands, and Denmark being the principal buyers. Only in recent years has the United States become a big importer of vegetable oils, for until recently we have relied mainly on animal fats. At present our imports of vegetable oils exceed those of any other country.

Sources of Vegetable Oils. The two big importing regions receive their supplies of vegetable oils from both middle-latitude and tropical countries. Thus in vegetable oils, as in sugar, agricultural products from the two great climatic zones compete in world markets. Huge

Coconut oil From copra, the dried meat of the nuts of the coconut palm (Philippine Islands Netherlands Indies) Much used in butter and lard substitutes important in soap as it gives whiteness, hardness, and quick-lathering qualities emulsions cosmetics perfumes, salves etc

Corn oil From corn or maize (United States Argentina) Salad oil, lard and butter substitutes soap, manufacture of linoleum leather dressing vulcanized rubber waterproofing fabrics and paint (a semidrying oil)

Cottonseed oil From seed of cotton plant (United States India) Salad oil lard and butter substitutes cooking oils sardine packing important in soap and washing powders medicines glycerine, emulsions waterproofing fabrics

Linseed oil From flaxseed (Argentina India) Major element in paints varnishes and enamels as it dries quickly forming a tough, durable and solid coating Used in printer s ink patent leather, putty glycerine vulcanizing rubber, and foundry cores

Olive oil From fruit of olive tree (Spain, North Africa) World renowned salad oil sardine packing Castile soap wool spinning lubricant

Palm oil From nut of Elaeis palm (Netherlands Indies, British West Africa) Soap candles tin plate manufacture, softening and finishing cotton goods

Peanut oil From nuts of peanut plant (India Senegal) Salad oil butter substitutes, cooking sardine packing, soap manufacture of cosmetics kid gloves, wool, silk, and artificial leather

Soybean oil From beans of soybean (or soya) plant (Manchukuo North China) Salad oil, lard substitutes soap glycerine, paint, varnish printer's ink, linoleum, foundry cores

FIG 331 Principal vegetable oils, their sources, and their major uses (The leading two producing areas are named in parentheses Compiled from United States Tariff Commission)

quantities of oil are produced annually in the United States from corn and cottonseed, but these oils are consumed principally within the country From the plains of Argentina, Canada, Minnesota, and the Dakotas, flax is obtained for linseed oil; Manchukuo exports both beans and oil from its soybean crop, and this Asiatic plant is of increasing importance in the United States; olive oil comes chiefly from four Mediterranean countries—Spain, Italy, Greece, and Tunisia The coconut is the most important source of tropical vegetable oils, the palm nut holding second place The coconut merits careful study because of its commercial importance, because it is widely distributed throughout the tropics, and because it illustrates how goods move into commerce even from the remote islands of the Pacific

Products from the Coconut. The coconut yields six commercial products: copra, coconut oil, coconuts, shredded coconut, oil cake, and coir fiber. Copra, together with the oil extracted from it, gives the coconut its chief commercial value Some coconut oil is exported by crushing mills in the producing countries, but the greater part of

the coconut crop is shipped as copra, or dried coconut meat. Mills in San Francisco, Hull (England), Hamburg, and other cities of the consuming countries extract the oil from the copra and sell the remaining fibrous mass, known as oil cake, for cattle feed

Small shipments of coconuts in the shell go to Europe and the United States A few specially equipped desiccating plants in Ceylon and elsewhere prepare and export the shredded coconut used for cakes and confectionery Finally, a coarse textile fiber, known as coir and used for floor matting, is obtained from the husk which covers the coconut

Distribution of Coconut-Producing Areas. The coconut is the most widely distributed of tropical export crops. The tree grows on practically all humid tropical coasts, and the exporting areas are scattered entirely around the world The leading producers are the Philippines, southern India and Ceylon, Malaya, and the Netherlands Indies

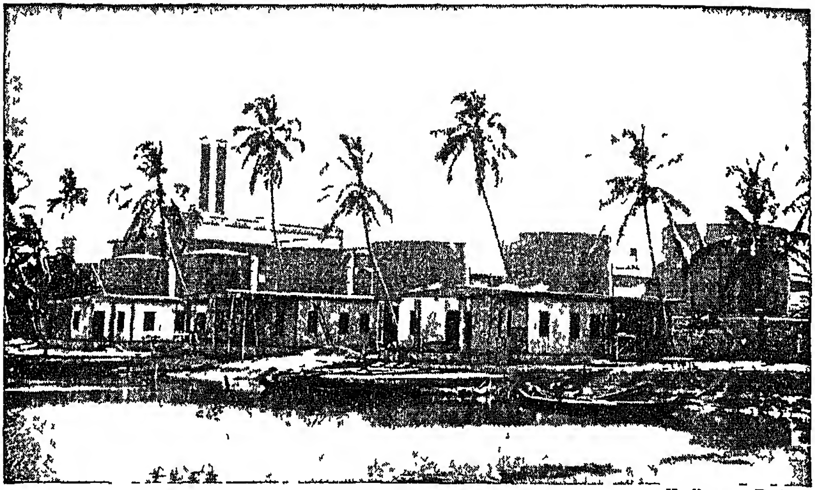
In Ceylon and southern India the coconut has been cultivated for hundreds of years, and these areas are famous for the quality as well as the quantity of their output. In Ceylon, "estate copra" is a trade name indicating high quality This grade comes from well-managed plantations, where scientific large-scale methods give a large yield and a uniform product The Philippines, the East Indies, and Caribbean America contain large plantations, and coconuts are grown on many banana plantations in Caribbean America The Pacific islands also add to the volume of the world's copra supply. Although each island ships but a small amount, the islands are numbered by thousands

Habitat of the Coconut Palm. The shore is the favorite habitat of the coconut palm. Many pictures show it growing on the very margin of the sea and leaning out over the water, where it revels in the brilliant tropical sunlight and the winds that sweep unchecked over the surface of the ocean (Fig. 332) It needs constant moisture, strong winds, and bright sunshine to make its best growth, and it commonly finds all these on the shore The moisture supply is more likely to be constant on the shore than elsewhere, particularly on the volcanic islands which make up many of the Pacific groups During the rainy season water soaks into the porous volcanic rock as it might soak into a sponge, and it slowly makes its way downward and out toward the margin of the island Thus the shore strip remains moist even after plants on the higher land begin to suffer from drought.

FIG 332 Coconut palms on the shore of Tahiti

Transportation Problems. Since the groves are on the coast, coconut products are placed on board ships without a long land haul In Ceylon the coconut-producing plain is cut by well-planned systems of canals, leading to the busy port of Colombo, where exporters buy, sort, and ship copra throughout the year, and where tea and rubber also are loaded On the west coast of Southern India both rail and water routes lead to Cochin, which exports the best grade of coconut oil known to commerce (Fig. 333) Many of the larger Philippine plantations are on the island of Luzon not far from Manila and are connected by rail with the port In Caribbean America, coconuts for the most part are grown in districts that have railways or improved roads to haul bananas, sugar, or other tropical products

Collecting Copra in Oceania. Collection from Oceania is another matter There the coconut groves are on islands scattered throughout a belt which touches both tropics and extends eastward from Malaya a third of the way round the world There are thousands upon thousands of islands, many of them extremely remote The Fiji group, for instance, contains 250 islands, 80 of which are large enough to be inhabited Clearly, it is out of the question for oversea liners to visit all the islands Besides, the greater number are without harbors that could accommodate large vessels



Wellington D Jones

FIG 333 Factory at Cochin, India, for extracting coconut oil

Trade routes and entrepôts. Fortunately, Oceania lies on the way to Australia, and a number of well-traveled sea routes cross the island world (Fig 334) Large ships call at the major islands which are convenient to their route and have safe harbors These islands have therefore become collecting centers, or entrepôts For example, copra is loaded at the Fiji Islands by ships en route from Australia to San Francisco, Seattle, or Vancouver by way of Honolulu; Tahiti, the largest of the Society Islands, is on the route of vessels that visit New Zealand on the way from Australia to San Francisco; and ships on the way to Panama carry copra to be crushed in Eastern United States or Western Europe.

The island entrepôts perform the functions of central markets and wholesale centers. Tahiti, for example, being centrally located with reference to the many island groups in the eastern part of the Pacific, has become an entrepôt for French Oceania. A hundred small sailboats and launches collect from neighboring archipelagoes They follow no fixed route or schedule, but go from island to island, wherever copra is to be had. In a similar way, copra is brought together at other entrepôts of Oceania, such as the Fiji and Samoan ports

Collecting from the individual islands The work of collecting from the individual islands of Oceania is illustrated by a voyage of the *Southern Cross*, which for many years operated from Tahiti It was an old sailboat, stanch and seaworthy, and, like the pirate craft

after which it was patterned, designed to get the maximum speed from a given strength of wind Manned by a crew of South Sea Islanders, strong, fearless, and as much at home on the water as sea gulls, it set sail for the Tuamotus, or Low Archipelago (Fig 335) The 78 atolls which compose this archipelago lie scattered throughout a belt of ocean 1000 miles long and have a total population of only about 5000. The surrounding waters are beset with coral reefs, and sudden gales frequently break upon them. Justly do the Tuamotus deserve the seamen's name of "the Dangerous Isles," and wisely do the larger vessels avoid them.

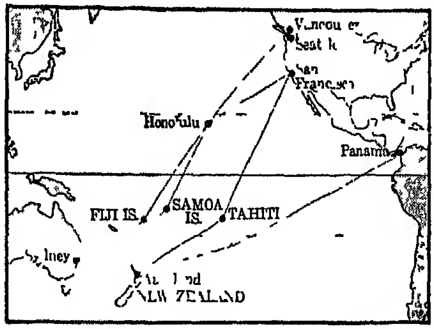


Fig 334 Principal ocean lanes in the South Pacific

One morning the captain sighted the islet of Niau, 10 or 12 miles away, and immediately, at his orders, the crew began bringing up merchandise from the hold and loading it into the longboat Before long, Niau could be seen as a four-mile ring of green enclosing a central lagoon. Bordering the palm-fringed outer shore was a moat of quiet water, and, outside the moat, waves dashed themselves to foam against the defenses of a submerged reef several hundred feet wide The landing revealed the daring and skill of the crew and the promptness with which the *Southern Cross* obeyed their will. With the longboat in tow, the schooner raced directly for the strip of foam surrounding the atoll Within 300 yards of the rocks the schooner turned aside, and the men in the longboat, casting off the line, took to their oars Within five minutes they were in the mighty current which rushed with deafening roar through the break in the reef. Holding their oars aloft to avoid the rocky walls, they were carried through the narrow entrance into the quiet water of the moat.

At the little store which stood on the coral shore opposite the break in the reef, the captain met and bargained with the resident trader Meanwhile, the crew, having drawn the longboat as close to the beach as possible, waded in the water and carried the cargo ashore. There were boxes of clothing and cotton cloth, bales of jute bags, cases of kerosene, cartons of patent medicines, and numerous gimcracks.

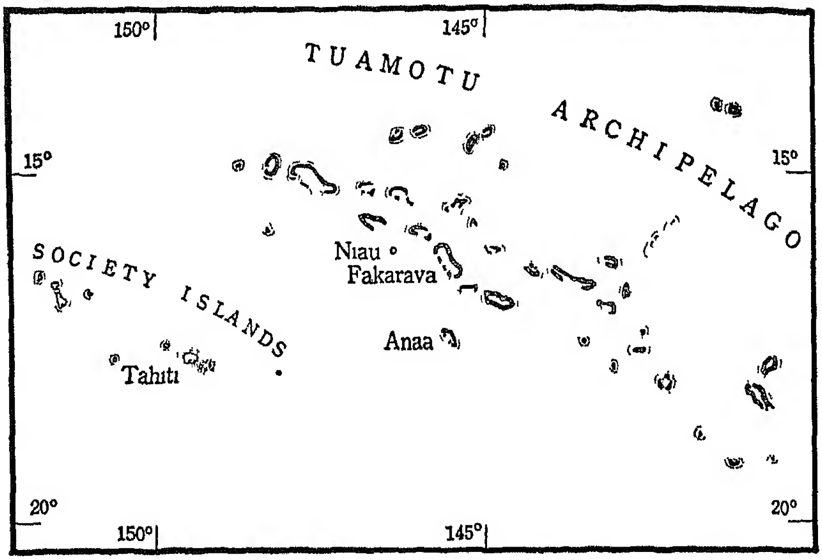


Fig 335 The Tuamotu Archipelago

These goods represent luxury to the natives of Niau, because they have little contact with other lands For a glimpse of the mysterious world beyond the sea they are willing to pay a high price in coconuts This was evident a few hours after the trading boat arrived The trader had set up a motion-picture machine in his copra shed, and the *Southern Cross* had brought a few reels of film from Tahiti Before the hour set for the show, 120 of the 200 inhabitants were seated on the ground before the screen, each having paid 25 coconuts for admission. In return they got a vision of romance and adventure in the American Wild West

Life in Niau is difficult and monotonous, for the resources of the little atoll are scant. The ring of coral limestone nowhere rises to more than 30 feet above sea level There are no rivers and no springs Few crops can be grown, because soil covers the broken and jagged rock in only a few protected spots, and the coral gravel dries rapidly after a rain. Aside from the coconut groves there is only a scant vegetation of low, coarse, wiry plants almost useless to man. The old trader's description of his daily fare (coconut and roast pig for breakfast, dinner, and supper, with yams and fowl for Sunday) needs only the addition of fish from the central lagoon to make a fairly complete list of the local resources.

Coconut the Staple Crop of South Sea Islands For the vast island world of the Tropical Pacific, the coco palm is the staple crop and yields the commodities which give these islands a place in the Commercial World The coconut makes life possible on these remote islands, and there is a saying that its uses are as many as the days of the year. The fruit is the food staple, taking the place of bread and butter, meat and salad It is ready at all times of year, for the coconut knows no season, but blossoms and ripens its fruit every month The shells serve as cups and bowls, and the milk of the unripe nut is a refreshing drink, greatly appreciated on the coral islands, because it is difficult to obtain a constant supply of fresh water The trunk supplies wood for the framework of houses, and the leaves serve as thatch for the roofs Coir fiber from the husk on the outside of the nuts is made into rope and is woven into a coarse cloth Copra as a commercial product is as typical of the South Sea Islands as silk is of Japan or sugar of Cuba.

QUESTIONS

1 What are five important uses of vegetable oils (Fig 331)?

2 What regions consume most of the vegetable oils that enter international trade? What regions probably produce the largest quantities for local use?

3 In a recent year the United States imported some 20,000 tons of copra from South Pacific islands (Fig 334) What entrepôts probably handled these shipments? Did the shipments probably go chiefly to our Atlantic ports or to our Pacific ports?

4 In the same year the United States imported 236,000 tons of copra from the Philippines What entrepôt probably handled these shipments? How was copra brought to the entrepôt from Luzon plantations? from plantations on other islands?

5 Western Europe imports three or four times as much copra as the United States, but the United States imports more coconut oil than Western Europe How may this contrast be related to the production of corn and other stock feeds (Fig 79 and pp 248, 249, 253–254, 416, 475, and Chapter XXXV)?

6 Singapore's trade in copra probably exceeds that of any other entrepôt From what coconut-growing areas does Singapore's supply probably come? How does Singapore's location favor this trade?

7 Is it probable that Singapore also serves as an entrepôt for palm oil? for cottonseed? for flaxseed? for soybeans? In each case give reasons for your opinion

8. For what other product of Oriental agriculture (besides vegetable oils and oilseeds) does Singapore serve as an entrepôt (pp 606–607)? For what important product of Oriental mines (pp 557–558)?

9. What qualities of the shore habitat are favorable for the coconut palm?

10. Why is the collection of copra from the Tuamotus a dangerous venture for seamen not well acquainted with the area?

11 Why is the coconut palm of great importance to the people of the Tuamotu and Society archipelagoes?

12 In Bermuda (a group of small coral islands in the Atlantic) most of the houses are provided with cisterns to store the rain water that falls on their roofs and thus to assure a supply of water for drinking and other domestic purposes Why *is this necessary?*

EXERCISES

1 *Vegetable oils and climatic belts*

Arrange the vegetable oils of Figure 331 in three groups, as follows (1) oils from plants grown principally in low latitudes, (2) oils from plants grown principally in middle latitudes, (3) oils from plants grown in important quantities in both tropical and middle-latitude areas

2 *Vegetable oils in the Orient and the Occident*

Arrange the vegetable oils of Figure 331 in three groups, as follows (1) oils which are produced mainly in areas beyond Suez, (2) oils which are produced on a commercial scale principally in the Americas, Europe, and Africa, (3) oils from plants grown for export both in the Orient and in the Occident

3 *Vegetable oils as to uses*

Arrange the vegetable oils of Figure 331 in two groups, as follows (1) oils used in the preparation of foods as well as for other manufacturing purposes, (2) nonedible industrial oils

4 *Groups of oil-yielding plants*

Arrange the oil-yielding plants of Figure 331 in four groups, as follows (1) trees, (2) grains, (3) legumes, (4) others

5 *Subjects for brief reports based on material in encyclopedia*

1 Peanuts and the Peanut Industry
2 Palm Oil and the Oil Palm
3 Coral and the Coral Animal
4 Atolls
5 The Coral Sea
6 The Olive Tree

CHAPTER XLIII

INDIA

India's Place in Commerce. India carries on a bigger commerce than any other Oriental country except Japan (Fig 29) In fact, only seven countries in the world surpass it in the total value of their commerce Many vessels enter Indian ports in ballast, the outbound ships, however, ride low in the water, indicating that they carry full cargoes This contrast grows out of the fact that India exports more than it imports The ships which bring cargoes do not provide enough space to carry all the exports Consequently, many empty ships move to Indian ports in the hope of finding the cargoes which they have been unable to secure elsewhere

Trades with manufacturing countries India trades principally with the middle-latitude countries of Western Europe, Eastern Asia, and North America Its commerce reflects its political connections, for its trade with the United Kingdom accounts for more than a third of the value of all exports and imports Its dealings with the rest of Western Europe amount to only a little more than its trade with Japan, the chief manufacturing country of the Orient The United States ranks next to Japan as a market for Indian exports, but India's imports from this country are small

Exports raw materials and foods. The ships sailing out of Indian ports are loaded chiefly with raw materials for manufacture and foods for industrial nations. The major exports are · (1) textile fibers, especially cotton and jute, (2) ores and crude metals, India being a major source of manganese and titanium, alloy metals used in steel manufacture; (3) oilseeds and vegetable oils, with peanuts and flaxseed the principal items; and (4) foods and cattle feed, including wheat, beans, and tea for human consumption, and rice bran and oilcake, by-products suitable for cattle feed

India's export of agricultural commodities is remarkable in view of the fact that India, with an area only half that of the United States, has a population nearly three times as large That there is a surplus for export reflects the presence of large areas of fertile land and of a population accustomed to only the bare necessities of life

Imports factory products and foods India ranks among the world's great consuming regions. Its food imports are remarkably small in view of the fact that the country has an average population density of

more than 200 per square mile It takes nearly half the rice exported from Burma and smaller quantities of peas, beans, and fruits Imports also include hams and bacon, butter and cheese, confectionery, and canned goods for British residents Factory products make up the bulk of Indian imports The importance of India as a market for British cottons will be recalled (p 443) Britain also exports to India heavy iron and steel products, textile machinery, tea machinery, and a wide variety of hardware Petroleum products (largely from Burma, Iran, and the Soviet Union) and motor vehicles also rank as major imports About a fourth of the automobile imports come from the United States, and American manufacturers furnish special types of machinery such as mining machinery, refrigerating machinery, tractors, plows, and typewriters.

India's Agricultural Wealth. Farming is an ancient art in India, and many of our familiar crops were grown there before the dawn of modern civilization Even today the life of India centers about its agricultural land Over great areas the land is level and fertile Frost is unknown in all the southern part of the country, and with the exception of the northwestern part the rainfall is sufficient for crops (see 20-inch line on Fig 337).

Agriculture related to seasonal rainfall Like Cuba and the Indo-Chinese deltas, most of India has a wet and dry tropical climate (Fig. 14). Interest in the culture of sugar cane and of rice (Fig 336) is in harmony with this fact In general the summers are hotter, the rainy season shorter, and the winters drier than in Cuba (Figs 338 and 56) Therefore, in spite of a frost-free climate, the fields in most parts of India bear crops during only part of the year, for little or no rain falls from November to April Unhappily, the summer rains come late in some years, causing a delay in planting crops Many times the rains are scant and then the crops suffer. The uncertainty of the rainfall is an age-old hazard, and before the day of railway transportation the crop failures of dry years caused famines.

Agriculture benefits from irrigation. For many centuries farmers in India have drawn water from streams and wells to irrigate their crops Even in the humid sections of the country water is needed to flood the rice fields. Under the direction of British engineers more and better irrigation works have been established in recent times, and agricultural production has increased.

So far as water supply is concerned, the lowlands of India are the

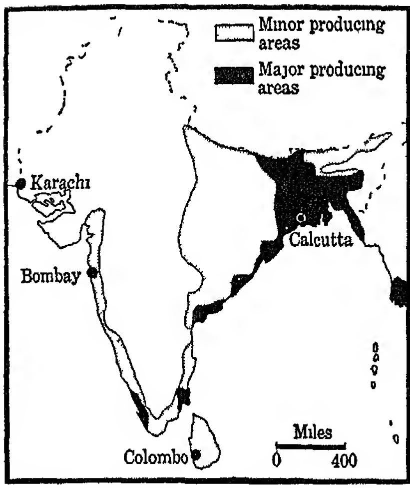


FIG 336 Principal rice-growing areas of India

FIG 337 Average annual precipitation in India

favored areas. The plains of the Indus, Ganges, and Brahmaputra rivers, supplied with water from the heavy precipitation on the Himalaya Mountains (Fig. 301), contain about three fourths of the irrigated land; most of the rest is on the narrow coastal lowlands of the peninsula. As in the Los Angeles citrus belt (pp. 212–213), much water from the mountains sinks underground and later is pumped to the surface to irrigate small fields.

In recent years some large modern irrigation projects have been developed. In the upper part of the Indus Plain, for example (Fig. 300), dams erected at or near the foot of the mountains direct the flow of water to a large desert area. Other works supply water in the dry season to lands which formerly produced only rainy-season crops. Farmers in such areas now are able to grow sugar cane and other long-season crops, or they may raise two or more short-season crops in a year.

Major food crops. Rice occupies nearly a third of India's cropland. The principal rice areas are lowlands where much of the land can be flooded. The largest of all is the delta formed by the Ganges and Brahmaputra rivers at the head of the Bay of Bengal (Fig. 300), and smaller districts lie on the coastal lowlands of the peninsula. Rice belongs particularly to the eastern half of the country, which gets more rain than the western half (Figs. 336 and 337).

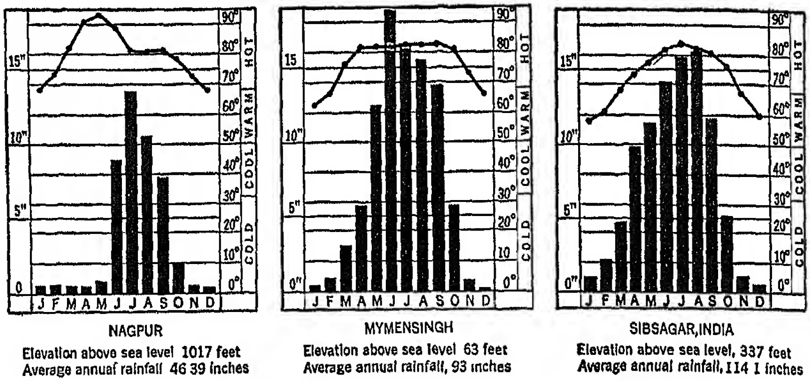


FIG. 338 Temperature and precipitation at Nagpur in central India, Mymensingh in the jute area, and Sibsagar in a Brahmaputra tea district

In recent years India has grown more wheat than Canada The crop is absent from areas of heavy rainfall (Figs. 339 and 337) It is an autumn-sown crop, and the area of largest production lies in the northern part of the plains of the Indus and Ganges, where the winters are decidedly cooler than the rest of the year.

The grain sorghums (jowar and bajra) and pearl millet together occupy more land than any other crop except rice. They are staple food grains in sections of light rainfall where water is not available for irrigating rice or wheat. Like wheat, they belong to the drier western half of the country (Figs 340 and 337), but, unlike wheat, they extend to the southern tip of the peninsula Legumes, such as beans and gram (a kind of pea), serve instead of meat in the diet of the people and also renew the nitrogen content of the soil

Bombay and the Cotton Crop. India's export cotton moves almost wholly through Bombay and Karachi, two ports that look out on the Arabian Sea A little more than half the export volume moves through the former and about 40 per cent through the latter These ports are well located to serve the cotton trade The cotton fields lie mainly in the western half of the country (Fig 341) Bombay stands opposite the major producing districts of the peninsula, and Karachi serves the irrigated districts of the Indus Plain About three fourths of the cotton exported through Bombay goes to Eastern Asia, but more than half of Karachi's export volume goes to Europe

Bombay is a more important cotton city than its share of the export trade would suggest. It is the principal cotton market of the coun-

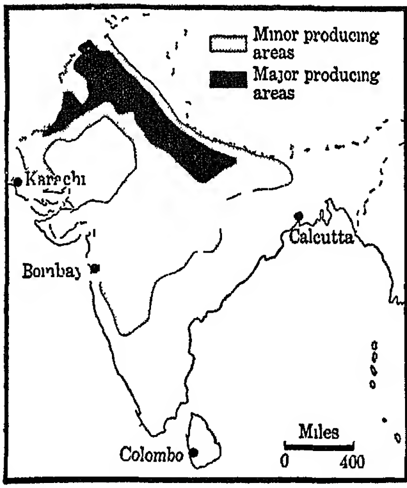


FIG 339 Principal wheat-growing areas of India

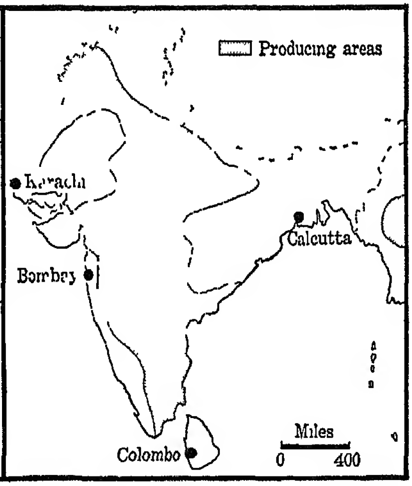
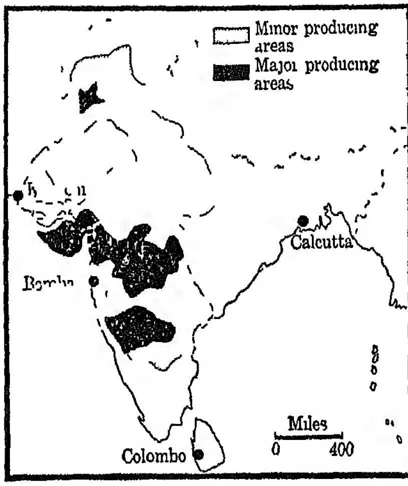


FIG 340 Grain sorghums and pearl millet in India

try and the principal cotton-manufacturing center. Thus it buys and sells cotton for domestic mills as well as for export, and it handles a large part of the cotton goods shipped to consumers in India and abroad Its cotton-goods exports go principally to the East Indian and Arabian trade regions, Tropical Africa, and countries bordering the eastern Mediterranean The domestic branch of the trade is much the larger, for out of every hundred yards of cotton cloth woven in Indian mills less than three yards are exported

Cotton in a land of light rainfall The cotton shipped to Bombay is grown on a rolling upland with a relatively light rainfall (Figs 341, 300, and 338) There is little irrigation, for the rivers flow in deep channels well below the level of the fields, and they dwindle to insignificant streams in the dry season The cotton crop therefore is dependent upon the rainfall, and drought frequently threatens crop failure The ground is too hard to be plowed until the rains begin, and the summer rains last only about four months This makes the moist season too short for American long-staple cotton The native cotton has a deeper root system and thus is well suited to the climate, but it produces a rather low-grade fiber too short for fine spinning. British mills therefore buy but little cotton from this area Instead, the crop goes to countries manufacturing large quantities of low-grade cotton goods, such as Japan, Germany, and Italy.



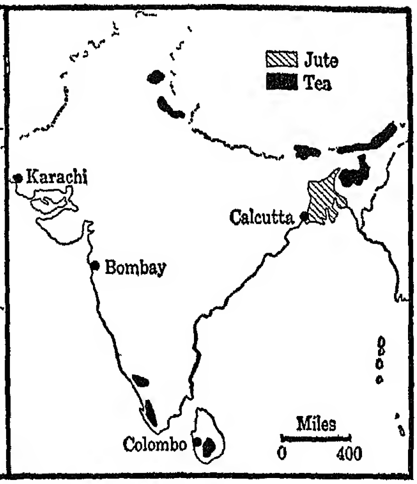


FIG. 341. Principal cotton-growing areas of India

FIG 342 Distribution of jute culture and tea culture

Water scarcity and the cotton soils. The most desirable soils of the cotton section are those which absorb much moisture during the rains and hold it persistently The famous "black cotton soils" of the Deccan Plateau (the upland back of the port of Bombay) are more fertile than most low-latitude soils. They lie upon comparatively level surfaces, and therefore the run-off is slow, giving the water time to soak into the ground Once thoroughly moistened, the "black cotton soils" remain moist for a long time—long enough in most years to ripen the cotton crop.

Crop combination and food supply. Cotton occupies only a small proportion of the cultivated land, for in the cotton section, as elsewhere in India, food production is the main duty of the fields Grain sorghums, the principal food cereals of this area (Fig 340), are hot-season crops, grown in rotation with cotton They are planted after the rains begin and harvested in the bright, clear weather of October or November The stalks of the sorghums, and also of cotton, serve as fodder for the cattle needed to plow the fields, to draw water from the wells, and to haul the cash products to market. Cottonseed also is used as cattle feed. In a few sections of the cotton area the fields may be planted, after the sorghum harvest, to alternate rows of wheat and gram In most sections, however, there is not enough moisture for dry-season crops

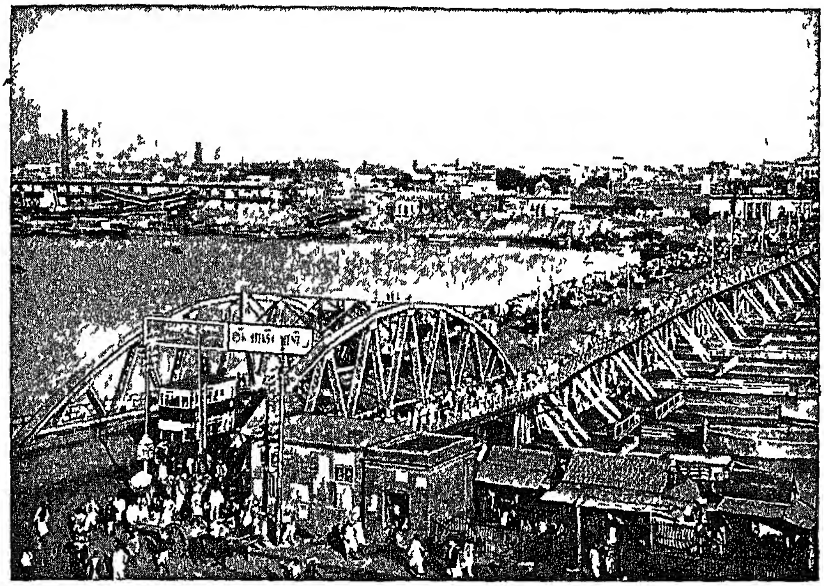
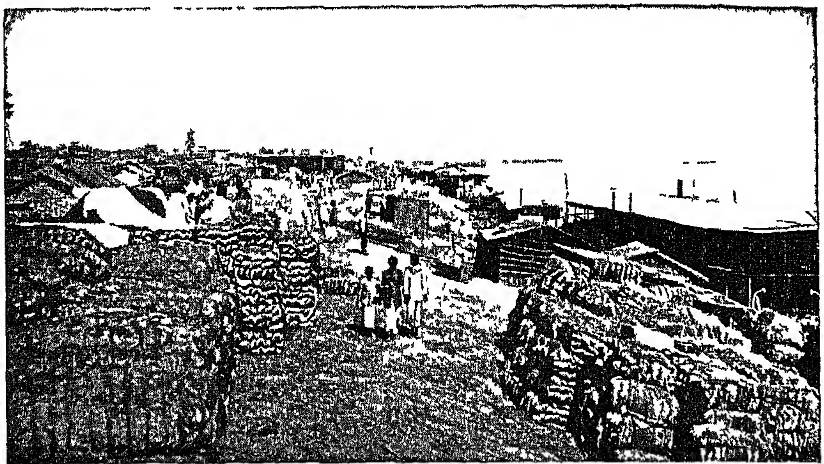


FIG 343. Industrial district along the Hooghly River, Calcutta Note the floating supports for the pontoon bridge

Calcutta and the Plain at the Foot of the Himalayas. Calcutta is India's leading port and a city of more than a million inhabitants (Fig 343). It owes its size and importance to its position at the principal gateway to the productive plain of northern India (p 564 and Fig. 300) Though the city has busy factories, it is primarily a port, for its major manufacturing industries have grown out of its trade Its port business, in turn, is concerned mainly with the broad plain at the foot of the Himalayas and with the neighboring hilly belt

Calcutta stands on the delta of the Ganges and Brahmaputra rivers, which is famous for its jute and rice crops (Figs 336, 342, and 344) Jute ranks high among the interests of the port, and rice is shipped from the delta to other parts of India and abroad. The Ganges Plain, above the delta, produces wheat, rice, sugar cane, cotton, and oilseeds Calcutta receives considerable quantities of agricultural products from the plain, though each family has only a small surplus for sale Tea gardens occupy hill sites overlooking the plain India's principal iron and steel works are located where plain meets hill country at the western margin of the delta. Coal mines, iron mines, and manganese mines are in the hill country somewhat farther to the southwest.



Wellington D Jones

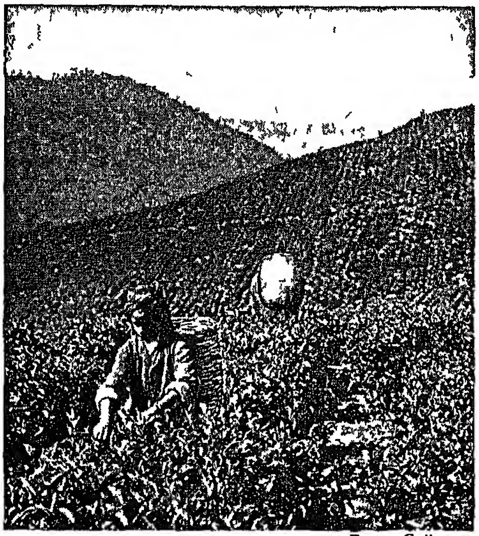
Fig 344 Baled jute awaiting shipment to Calcutta by river steamer

Jute · a Geographic Monopoly. The most distinctive crop of the Ganges-Brahmaputra Delta is jute, a fiber crop long grown there to make cheap clothing for poor people Jute fiber, like flax fiber, is obtained from the stem of the plant It is the cheapest and the weakest of the important textile fibers, but it has found a large place in commerce Bales of cotton and of wool go to market in jute wrappings, while coffee, sugar, and rice are shipped in gunny sacks made of jute. Fabrics of jute are used also as a base for linoleum, as coat padding, and as wall coverings

The Ganges-Brahmaputra Delta produces practically all the world's raw jute, and Calcutta manufactures jute cloth and jute bags Calcutta exports raw jute principally to Western Europe, the United Kingdom and Germany taking the largest quantities The United States and Argentina buy large quantities of jute cloth, whereas Australasia, the East Indian Trade Region, and Caribbean America are large buyers of gunny sacks

Jute-growing area Jute culture occupies a small alluvial area in the eastern part of the Ganges-Brahmaputra Delta (Fig. 342) Conditions there are particularly favorable for the crop—so favorable, in fact, that no other area has been able to compete in producing jute. In the first place, jute is a hot-season crop which requires much moisture, and the delta has hot weather and plentiful moisture during the months corresponding to our spring and summer (Fig. 338) In the

second place, it needs rich soil, and the fertility of the jute lands is renewed annually by the floods of the Brahmaputra In the third place, showers come early enough to permit planting in March, thus giving the crop time to mature before the fields are flooded in June or July by heavy rains and the run-off from the mountains Finally, the people of the Ganges-Brahmaputra Delta have had long experience in the difficult and disagreeable task of retting jute to extract the fiber



Ewing Galloway

FIG 345 Picking tea in Ceylon

The jute trade The jute trade of Calcutta has reached the third stage of its development In the first stage the export consisted of bags made from jute cloth woven by hand in the Calcutta area Then the Scottish city of Dundee took up the spinning and weaving of jute As the demand for gunny bags increased, raw jute rose to first place among Calcutta's exports In the third stage nearly a hundred modern mills have been established on the outskirts of Calcutta, and these mills manufacture more jute than those of any other city in the world In the export trade of Calcutta, jute manufactures now have a value nearly double that of raw jute

Tea—an Industry Transplanted. China and Japan formerly produced the whole of the world's tea supply, but about a century ago it was found that tea grew wild in northeastern India. The East India Company started an experimental garden, and a tea auction was held in Calcutta in 1840 Now India and Ceylon together produce nearly two thirds of the tea of international trade. Java also has a large crop, but China probably still produces more than any other country Most of the Chinese crop, however, is consumed locally

Tea occupies relatively small areas in three sections of India—the plain of the Brahmaputra, the foothills of the Himalayas, and the

hills flanking the southwest coast. It is an important crop also on the hill slopes of central Ceylon (Fig. 342).

Political advantages Government favor and British business organizations have had much to do with the success of India's tea trade. For the most part the plantations are owned by large London companies engaged in selling tea (p 436) Under their management scientific methods of culture have been adopted, and nearly all the work except picking the leaves (Fig 345) is done by machinery. Advertising campaigns have resulted in a bigger demand for tea The industry is not taxed heavily, and Indian tea, being produced within the British Empire, is admitted into Britain on more favorable terms than that grown elsewhere. The Chinese industry, in contrast, depends entirely on handwork, there is no large-scale organization of producers, little or no advertising has been done, and the industry has been overtaxed

Favorable climate Tea culture in the Brahmaputra Plain thrives under a climate suitable for the crop. The Brahmaputra tea district is in the same latitude as southern Florida, and the cool season is so mild that it really should not be called winter The summer rains begin in March and continue through October (Fig 338) During this warm and humid period tea is gathered three or four times each month In China, where the moist season suitable for leaf growth is much shorter, only three (or at most four) pickings can be obtained annually For this reason the yield per bush is much larger in India than in China

Location and shipping services Tea-growers in India and Ceylon have decided advantages over the Chinese growers for shipping tea to London, the world's great tea market The tea districts have railway services to one of the major ports, and the distance to London is shorter than from Chinese ports Moreover, for the Chinese producers, the handicap of greater distance is increased by difficulties of shipment to the point of export Tea is produced by thousands of families scattered over a vast expanse of country To reach a shipping point on river or railway, much of the tea is carried for many miles in baskets suspended from the shoulders of men.

QUESTIONS

1 Which have the greater bulk, Indian exports or Indian imports? What influence has this contrast on the movement of ships?

2 Does India lie in low latitudes, in middle latitudes, or in both? How is this fact reflected in Indian agriculture?

3 Where is India's largest area of level lowland? Does this lowland receive rain principally in summer, principally in winter, or about equally in all seasons? How does this fact affect agriculture?

4 How does the population density of the Himalayas compare with the general population density of India? In what way does the population density of the Ganges Plain depend on the Himalayas?

5 What products of Indian agriculture probably form important cargoes for vessels en route to Europe via Suez? What products of Indian mines?

6 Where do Indian manufacturers of iron and steel obtain their supplies of ore and coal?

7 What part of India is desert (Figs 14 and 337)? What major export crop does this area produce? How is the crop watered?

8 A westbound ship on the Suez Route carries Indian cotton for British mills At what port did it probably take on the cotton? Give your reasons for thinking so

9 What ports handle the trade of India's great deltas? Which has the larger trade? What bearing has climate on this contrast?

10 What is Bombay's chief industry? Where is the output of the mills sold? How do Lancashire companies probably feel about the success of Bombay (pp 443-444)?

11 In what way is the development of the Japanese cotton industry an advantage to India? In what way may it be a disadvantage?

12 What interest have the jute-growers of India in the sugar industry of Cuba? in the coffee industry of Brazil? in the use of linoleum for floor covering in American homes?

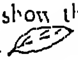
13 What sections of India grow tea? Does the tea district about Sibsagar get rain chiefly in summer or chiefly in winter?

14 What country buys most of India's export tea? What bearing have political ties on the tea trade?

EXERCISES

1 *Tea in the Orient*

Total exports of tea in a recent year amounted to 425,000 tons Of this amount, China furnished 40,000 tons, Japan proper, 18,000 tons, Taiwan, 10,000 tons, Netherlands Indies, 76,000 tons, Ceylon, 109,000 tons, Continental India, 160,000 tons.

a Make a graph to show the relative importance of the principal sources of export tea. Let one leaf  stand for 10,000 tons. Color green each leaf representing exports from middle-latitude areas of the Orient, color black each leaf representing exports from tropical areas of the Orient, and leave uncolored each leaf representing exports from areas outside of the Orient.

b Prepare a talk on the subject "Tea in Oriental Specialty." Use information contained in your graph in this chapter, and on pages 436 and 570–571. Further information may be obtained from an encyclopedia.

2. *India's trade across land boundaries*

Use the questions listed below as a guide in studying India's trade over land routes leading to neighboring countries of Asia.

a Where, judging by the railway pattern (Fig. 303) does India trade with neighboring countries across land boundaries?

b What country is reached by trails leading northeastward from the Brahmaputra Valley (Plate VII)? Do such trails reach a tropical or middle-latitude section of the country? What commercial product might be obtained from that section (Fig. 312)?

c With what country may India trade via the Khyber Pass (Fig. 302)? What type of surface and what type of climate are characteristic of that country (Figs. 15 and 11)? Suggest typical products likely to move into India via the Khyber Pass.

d What country touches the eastern boundary of India? What two important products may it sell to Indian people (pp. 337 and 593)?

3. *Oriental exports shipped via Suez*

Among the commodities which northbound ships carried through the Suez Canal in a recent year were (1) wheat, (2) jute fiber, (3) soybeans, (4) gunny sacks, (5) rice, (6) copra, (7) peanuts, (8) cotton, (9) abacá fiber, (10) sugar, (11) tea, (12) coconut oil, (13) petroleum, (14) manganese ore, (15) rubber, (16) raw silk, and (17) flaxseed.

For each commodity, name an area from which the commodity may have come.

7

SOUTHERN HEMISPHERE REGIONS

CHAPTER XLIV

SOUTHERN HEMISPHERE REGIONS—THEIR PLACE IN COMMERCE

The Southern Hemisphere has three middle-latitude regions of commercial importance—Southern South America, Southern Africa, and Australasia Together these regions have a land area nearly as large as the United States and Canada, but they contain only about a third as many people as the United States Australasia has the largest area and the smallest population of the three. Middle Latitude South America is about twice as large as Middle Latitude South Africa and has a little more than twice as many people

Countries and Resources. The middle-latitude regions of the Southern Hemisphere include nearly a dozen countries, large and small, independent nations and colonies of European nations Middle Latitude South America consists wholly of independent nations The other two regions are made up wholly of colonies Each region contains one country that ranks far above its neighbors in commercial importance These countries are Argentina, the Union of South Africa, and Australia

Middle Latitude South America The middle-latitude section of South America includes Argentina, Uruguay, Paraguay, Chile, and the part of Brazil that lies south of the coffee region Middle Latitude South America has a much larger area of cropland than South Africa and Australasia together, for it includes the great lowland plain drained by the Rio de la Plata and its tributaries, and much of the plain has a humid climate The plain, which lies mainly within the boundaries of Argentina, Uruguay, and Paraguay, contains most of the cropland and more than half the population of the region The highland of the Andes occupies the western part of the region, the crest of the mountains forming the boundary between Argentina and Chile The mountain belt contains fertile valleys in Chile and a number of productive piedmont plains in Argentina It also has valuable mineral resources, and in the south it is forested.

Southern Africa Nearly the whole of Southern Africa belongs to the British Empire. The region includes the Union of South Africa, Southern Rhodesia, the British protectorate of Bechuanaland, and the former German territory of Southwest Africa, now governed by the Union of South Africa under mandate from the League of Na-

tions. In addition, Mozambique, or Portuguese East Africa, extends a short distance beyond the tropic of Capricorn. Most of the 11 million inhabitants of the region live in the Union of South Africa.

Southern Africa is mainly upland—the southern tip of the plateau that makes up most of the continent. Lowlands are limited to a narrow strip of plains bordering the coast. The region has extensive areas of level land, but it is handicapped by a scarcity of moisture. The mountains that rise above the eastern edge of the plateau get plenty of rain, but the climate of the plateau itself varies from semiarid to desert. Conditions do not favor irrigating the plateau land, for the rivers flow in gorges cut far below the plateau surface. Thus the plateau is devoted mainly to grazing industries.

The coastal lowlands are the principal crop-growing areas of Southern Africa. A small area near Cape Town is fairly humid, with more rain in winter than in summer. The coastal lowland of the southeast also is humid, with most of the rain falling in the warmer half of the year. This is the principal sugar-producing area of the region.

Southern Africa has important mineral resources. In addition to the most famous diamond fields of the world, it contains the Witwatersrand district of the Transvaal, which produces more gold than any other district of the world—more than any other country produces, in fact. Southern Africa also has some coal, chrome ore, asbestos, and iron ore, and it ranks among the major world producers of manganese ore. The principal mineral-producing area is on the plateau, somewhat back from the escarpment that faces the southeast coast. Mineral deposits occur there at intervals in a belt some 1400 miles long.

Australasia. The most remote of the Southern Hemisphere regions consists of Australia and New Zealand. Australia is a continent about the size of the United States, but it contains fewer people than live in Illinois. It has a vast extent of level land, but most of the continent gets too little rain for crops. New Zealand consists of two mountainous islands located more than 1200 miles from Australia. Its area is about equal to that of Colorado, and it has about as many inhabitants as Connecticut. It has a climate similar to that of our Pacific Northwest, with mild, rainy winters and relatively dry summers. It is a fine dairy country, but it has a scant amount of level land.

Australasia has mineral resources of considerable importance. Both Australia and New Zealand have coal deposits, and Australia

mines some iron ore for domestic use. The coal and iron deposits of Australia are in the southeastern part of the country, where most of the people live Both countries have gold deposits Australia ranks among the world's major lead-mining countries and produces fairly large quantities of zinc

Commerce of Southern Hemisphere Regions. The combined exports and imports of the countries in southern middle latitudes account for less than 10 per cent of the world's international trade Nevertheless, these remote regions play important roles in world commerce Two countries, Argentina and Australia, are classed among commercial countries of second rank (p 54), Chile, Uruguay, New Zealand, and the Union of South Africa take lower rank.

All the countries of the Southern Hemisphere regions find in Western Europe the principal markets for their exports (Fig 238), and the United Kingdom is their best customer Logically, then, they buy chiefly from Western Europe, particularly Britain The share of the United States in their trade is less than 20 per cent, except in the case of Chile In general, we import a little more from the countries of Middle Latitude South America than we export to them From South Africa and Australasia, however, we import very little

Principal exports There is some similarity in the general nature of the export trade of the three widely separated regions in southern middle latitudes, but there are also striking differences in the export lists Three groups of industries furnish most of the export commodities —the livestock industries, crop-growing, and the mineral industries (Fig 346). Livestock products take first place among the export groups when the three regions are considered together, and wool ranks first in this group. In fact, the three Southern Hemisphere regions produce more than five sixths of the world's export wool Minerals rank next to livestock products, and gold leads the mineral exports in value Among the exports from crop lands, cereals take first place, the principal cereals grown for shipment being wheat, corn, and flaxseed Crop exports surpass in value the exports of minerals other than gold

The relative importance of the Southern Hemisphere export groups differs from one region to another Australasia has relatively little land suitable for crops, and livestock products account for nearly two thirds of the value of all its exports In Southern Africa both grazing and agricultural industries are overshadowed by mining. In Middle

Principal Exports	Middle Latitude South America	Australasia	South Africa
Products of livestock industries			
Meats shipped under refrigeration	$79 000,000	$86,000 000	$2 000 000
Canned, salted dried meats and meat extracts	14 000 000	1 000 000	1 000 000
Hides and skins	40,000 000	25 000 000	10 000 000
Other packing-house products	15,000 000	13 000 000	——
Wool	78 000 000	260 000 000	48 000 000
Dairy and poultry products			
Butter	4 000 000	97 000 000	2 000 000
Cheese casein dried milk eggs	5 000 000	30 000 000	1,000,000
Products of crop land			
Wheat and flour	64 000 000	74 000 000	——
Corn	148 000 000	——	2 000 000
Flaxseed	73 000 000	——	——
Other grains and grain products	32 000 000	2 000 000	——
Fruits	3 000 000	19 000 000	16 000 000
Sugar	1 000 000	8 000 000	6 000 000
Cotton	13 000 000	——	——
Tobacco	——	——	4 000 000
Wines	——	4 000 000	1 000,000
Products of forest industries			
Lumber and railway ties	——	4 000 000	——
Tanning materials	12 000,000	——	4 000 000
Furs	3,000 000	10 000 000	——
Products of mineral industries			
Coal	——	——	9,000,000
Nitrates	33,000,000	——	——
Diamonds	——	——	16,000 000
Asbestos	——	——	6 000 000
Gold in metallic form	——	41 000,000	419 000 000
Copper in metallic form	44 000 000	——	2 000 000
Ores and concentrates of iron, zinc copper, gold silver tin and other metals	6 000 000	4 000 000	3,000 000
Other mineral products	3 000 000	24 000 000	2 000 000

FIG 346 Principal exports of Southern Hemisphere regions in a recent year

Latitude South America, with its large area of humid and fertile lowland, crop-growing accounts for nearly half the value of all exports Furthermore, livestock kept on cultivated pastures furnishes much of the meat shipped under refrigeration.

Nature of imports The nature of the imports into the countries of southern middle latitudes reflects the needs of basic industries (Fig 5) in those countries and the fact that manufacturing is not highly developed Agriculture, mining, and newly established factories call for imported machinery The fencing of large areas of graz-

ing land creates a need for fence wire Many thousands of jute bags are used for shipping grain, wool, and ore Long distances make the motor vehicle a convenience Travel, transportation, and the use of machinery lead to the import of lubricants and of fuel for power Each of the countries imports petroleum products, and the South American countries also import coal Textile fabrics and clothing still form large import items, in spite of interest in establishing textile mills during recent years. Certain food products also appear regularly among the imports—tea from the Orient, coffee from Tropical America, and canned goods from the United States, for example

QUESTIONS

1 How do the Southern Hemisphere regions (taken together) compare with the United States in size? in population?

2 Which of the regions is largest? Which has the largest population?

3 What natural conditions hinder the support of large populations in southern middle latitudes? Explain the effect of these conditions

4 Where do the people of the Southern Hemisphere regions sell most of their exports (Fig 238)?

5 Which of the export items listed in Figure 346 appear among the list of major imports into the United States (Fig 30)?

6 Which of the commodities listed in Figure 346 are also produced on a large scale in the United States?

7 Why is not the United States a very large customer of the countries in southern middle latitudes?

EXERCISES

1 *Regions in southern middle latitudes*

Prepare a map to show the middle-latitude regions of the Southern Hemisphere and the leading export line of each region Follow these directions

a Shade lightly on an outline map of the world all the countries included in the three regions

b Add symbols of your own choosing to show
   (1) The region which ranks first in the value of mineral exports
   (2) The region which ranks first in the value of grain exports
   (3) The region which ranks first in the value of livestock products exported

2 *Empire countries and independent nations of the South*

Arrange the countries of the Southern Hemisphere regions in three lists as follows (a) countries of the British Empire, (b) colonies of other European nations, and (c) independent nations Study your lists and write observations

CHAPTER XLV

MIDDLE LATITUDE SOUTH AMERICA

1. *Commerce and Resources*

Place among Southern Hemisphere Regions. Like Australasia and Southern Africa, Middle Latitude South America is an important source of foods and raw materials for the manufacturing regions of the Northern Hemisphere It has more people than the other two Southern Hemisphere regions together The larger population provides a larger supply of workers for industries and suggests a more generous supply of resources But the three regions do not differ greatly in total value of trade, if the export value of gold is included[1] Each region surpasses the others in some branch of trade, and Middle Latitude South America excels in certain lines of production that depend upon rainfall

Exports reflecting humid climate Trade in products of farms, grazing lands, and forests reflects Middle Latitude South America's good fortune in having a large area of humid lowland This region has large acreages of cultivated land devoted to the production of grain and the feeding of livestock, extensive areas of humid grass land, and forest resources differing from those of any other region in the world Thus it ranks high in the export of grains, particularly corn and flaxseed (Fig 346), it surpasses the other Southern Hemisphere regions in the export of packing-house products, and it is famous for the tanning material obtained from its quebracho forests

Resources of industrial minerals Middle Latitude South America ranks first among Southern Hemisphere regions in tonnage of mineral exports, but in total value of mineral products it is surpassed by Southern Africa This contrast reflects a difference in the nature of the mineral resources. Whereas Southern Africa is rich in gold and diamonds, Middle Latitude South America has large resources of minerals that are needed in huge quantities by modern industries (Fig 346) It is a major world source of copper and nitrates, and it has some deposits of high-grade iron ore It also has a little coal and petroleum, but it does not produce enough of these fuels to serve the needs of its industries

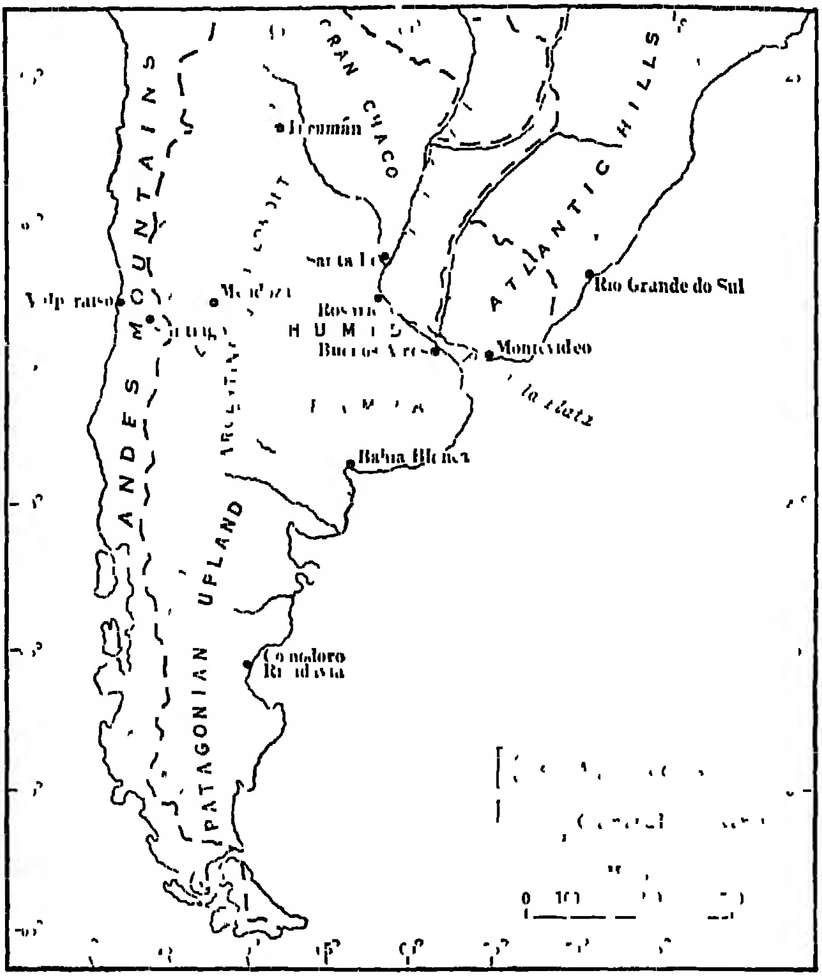
[1] Generally the precious metals are not included in the totals of tables giving the exports and imports of countries.

Market for products of other regions. Middle Latitude South America, with its 25 million inhabitants, is an important market for exports from other regions. In the annual value of its foreign purchases it does not differ greatly from the other two Southern Hemisphere regions. Like them, it buys more from Western Europe than from any other region, but it buys a smaller proportion of its imports from the United Kingdom than they do. Like them also, it buys iron and steel products, machinery, automobiles, and textile manufactures, but Middle Latitude South America is the only one of the three that uses important quantities of European coal. As an importer of textile products other than jute manufactures, it is the least important of the three regions, in spite of its larger population.

Contrasts within the Region. The industries and the export trade of Middle Latitude South America indicate an uneven distribution of resources within the region. North differs from South, and East differs from West. The contrast is particularly striking when one compares the trade of the two coasts. Most of the grain, wool, packing-house products, and tanning material are shipped from east coast ports, but most of the mineral exports leave the region by way of Pacific ports.

Countries differ in resources. Each country of the region differs from its neighbors in its combination of major resources. Chile, the one west coast country, excels in its mineral resources and is known in world trade chiefly for its mineral exports. Argentina, Uruguay, and Southern Brazil all export packing-house products—a fact suggesting resources of agricultural or grazing land. Argentina and Uruguay also export grain and wool, and the quebracho forests of Argentina and Paraguay yield tanning material for export.

Land forms and resources. Contrasts and similarities in the products of individual countries are related to the fact that land forms in Middle Latitude South America are arranged in north-south belts. On the west is the great Andes highland, in the middle is the Paraná Plain, and along the Atlantic coast a belt of hill country extends from São Paulo nearly to the Rio de la Plata (Fig. 347). The western highlands contain most of the mineral deposits, the Paraná Plain is famous for its rich soils and its wild-grass pastures, and the hilly belt is a source of forest products. Chile and Argentina divide the highland belt between them; Argentina, Uruguay, and Paraguay share the resources of the Paraná Plain; the Atlantic belt of hills lies mainly in Southern Brazil, but extends into Uruguay and eastern Paraguay.



Manufacture Related to Trade. Though Middle Latin South America is not a manufacturing region, it has factory industries of considerable importance related to its trade. The prominence of two groups of industries reveals the development at certain world-famous ports. Industries of the first group prepare export commodities for shipment; those of the second group use imported raw materials and manufacture for domestic markets. Meat packing, flour milling, and copper smelting belong to the first group, while petroleum-refining and textile manufacture are important examples of the second. In

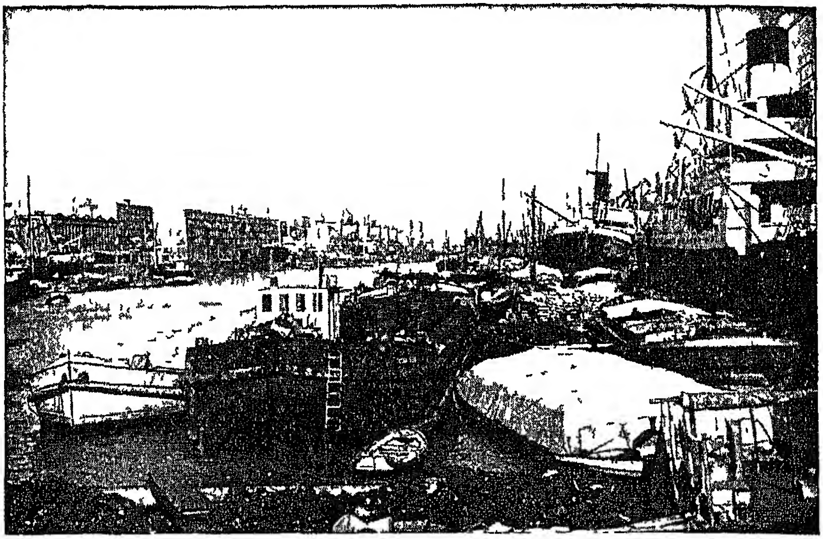
harmony with the close relation between industries and trade, the major ports are also the principal manufacturing centers

Manufacturing industries have expanded a good deal during recent years, their growth stimulated by an increasing population, by scientific discoveries, and by the restrictions that hampered trade during and after the war of 1914–1918 (compare pages 281–282). New methods enable mining companies to ship increasing quantities of metallic copper, for example, whereas their exports formerly consisted chiefly of ore and concentrates But the more conspicuous change concerns industries of the second group, many of which have received government aid in the form of protective tariffs Formerly a large market for refinery products, the region now imports relatively little gasoline and kerosene but annually receives several million barrels of crude oil from foreign fields to be refined for domestic use To an increasing extent also, people are clothed in fabrics of domestic manufacture Several hundred textile mills in Argentina, Chile, and Uruguay now provide nearly all the woolen goods and coarse cotton cloth needed in those countries In Middle Latitude South America, as in Europe, the countries are striving to cut down their imports

2. *The Paraná Plain and the Atlantic Hills*

Paraná Plain, North and South. Within middle latitudes the Paraná Plain has a north-south extent about equal to the distance from Philadelphia to southern Florida Hence the cooler southern part of the plain differs a good deal from the subtropical north In the south is the moderately peopled area known as the Humid Pampa, famous throughout the Commercial World for its wheat and cattle The Gran Chaco, the northern section of the plain, consists mainly of unplowed grasslands, swamps, and forests Its commercial importance depends mainly on its grazing and forest industries, but scattered agricultural communities produce cotton and other crops resembling those of tropical lands.

The Humid Pampa. Extending some 350 to 400 miles north, west, and south from Buenos Aires, the Humid Pampa lies mainly in Argentina, though it also includes the level southern part of Uruguay On a map of South America this area stands out conspicuously because of its closely spaced railways (Fig. 347 and Plate IV) The network of



James Sawders

Fig 348 The water front at Buenos Aires Big ocean-going vessels enter the Rio de la Plata to deliver products from Northern Hemisphere factories and to load grain and livestock products of the Humid Pampa Grain elevators are shown in the center distance

railways extends inland to the margins of the farming area that produces on a large scale for export This area contains nearly three fourths of the population of Argentina and Uruguay, produces most of the grain exported from Middle Latitude South America, and feeds about a third of the cattle and sheep of the region

Major Ports and the Littoral Belt. The railway net of the Humid Pampa touches deep water on both shores of the broad Rio de la Plata Ocean vessels visit Buenos Aires and Montevideo on opposite sides of the estuary, ships of moderate size continue up the Paraná to the port of Rosario, and smaller vessels may reach Santa Fe, 500 miles up the Paraná River from Buenos Aires. The business of these ports is concerned principally with the Humid Pampa, but long railway arms connect them with the Gran Chaco and with scattered settlements at the foot of the Andes Most of the commodities imported into Argentina and Uruguay enter through Buenos Aires (Fig 348) and Montevideo and are distributed by wholesalers in these cities.

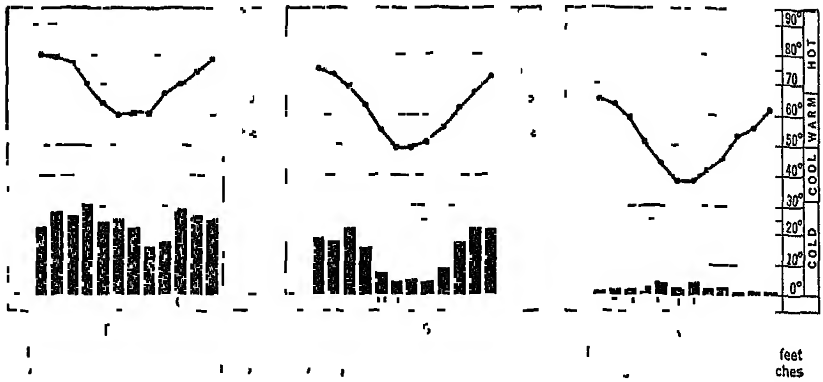
Port equipment for handling Pampa products The equipment of the major ports reveals a strong interest in the grain and livestock in-

dustries of the Humid Pampa. Big grain elevators are lined up along the water front of all the major ports Livestock markets handle the trade in cattle and sheep, and there are warehouses for sorting and packing wool Meat-packing plants similar to those in the United States are located at all the major ports and at some minor ports as well The packing plants produce mainly for European markets, and about half of them are run by North American or European companies All the packing plants have departments to handle hides and skins and other by-products

Littoral belt as consuming area Trade has led to a remarkable concentration of people along the Rio de la Plata and along the navigable lower courses of the Paraná and Uruguay rivers In addition to the factories producing for export, the cities of this belt contain most of the flour mills, textile factories, foundries, and other plants manufacturing for domestic markets in Argentina and Uruguay. Buenos Aires, with its suburbs, has nearly as many people as Chicago, Montevideo has a population of about three quarters of a million; and Rosario is a city of a half million Together, the cities, towns, and rural communities of the littoral belt have a population of five or six million people They make up a consuming market of much importance to flour-manufacturers, meat-packers, textile-manufacturers, and importers, as well as to farmers and stockmen

To serve the market created by the great ports and other towns and cities, an area of specialized agriculture has developed on both sides of the Rio de la Plata and along the lower Paraná Dairy and poultry farms provide milk, cream, butter, poultry, and eggs for local markets and milk for factories that make butter and casein for export Market gardens and orchards supply fresh vegetables and fruits Since the Argentine part of the littoral belt has the larger population, many Uruguayan growers "export" their products to Argentina, shipping by ferry across the river to Buenos Aires city markets

Assets of the Humid Pampa. The oversea trade of Argentina and Uruguay and the growth of cities along the shores of the Rio de la Plata reflect certain natural conditions that favor large-scale agriculture in the Humid Pampa The level surface permits the use of agricultural machinery, the rich grassland soils, the long, hot summers, and a moderate amount of rain in all seasons (Fig 349) favor the growth of crops; and the winters are mild enough so that cattle graze in alfalfa pastures even in the colder months.



[illegible] ntina [illegible] Humid [illegible] from [illegible]

[illegible] Humid Pampa [illegible] ndi[illegible] nues [illegible] has [illegible] Pata- [illegible] win- [illegible] Humid Pampa [illegible] ls in [illegible] eases [illegible] more [illegible]

Agriculture of the Humid Pampa [illegible] Humid [illegible] for [illegible] arge [illegible] nted [illegible] land [illegible] large [illegible] great [illegible] hese [illegible] have [illegible]

[illegible] Humid Pampa [illegible] business of [illegible] located [illegible] west of Buenos Aires is fatt[illegible] cattle [illegible] there are on the estate betw[illegible] 5[illegible] ,000 [illegible] have been shipped from the grazi[illegible] g lands

of the Dry Pampa farther west Each lot of young stock is fed in alfalfa pastures for five or six months and then sold to packers in one of the La Plata ports The owner of the estate is both businessman and farmer, and the buildings at estate headquarters make up quite a village The spacious residence of the owner is surrounded by parklike groves, orchards, and gardens There is an office for the bookkeeper, a blacksmith shop, small houses for the workmen and their families, stables for saddle horses, and a few other buildings, but this land of mild winters has no huge barns or tall silos like those of the North American Corn and Dairy belts.

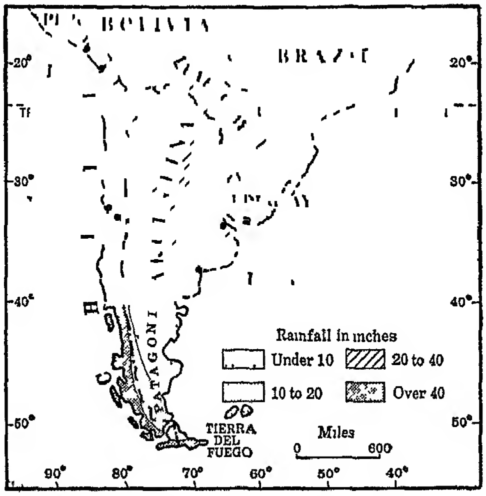


FIG 350 Average annual precipitation in Middle Latitude South America

The land of Estate C is laid out and planted according to the needs of the livestock. Wire fences with posts of quebracho wood enclose 30 fields, each as large as a Corn Belt farm; and each field has a well with a windmill to keep the drinking tanks filled In a recent year 21 of the fields were in alfalfa, which grows so well there that cattle in the pastures need no other feed to fatten them In addition, four fields were planted to corn, three to oats, one to grain sorghum, and one to wheat Grains serve as rotation crops for cultivated pasture land, furnish an additional source of income, and form emergency supplies of feed.

Grains as rotation crops A good deal of export grain comes from Pampa ranches where it is grown for the benefit of pasture land. After five or six years an alfalfa pasture becomes rather poor and needs to be plowed up and reseeded Generally the condition of the soil is improved by growing wheat, corn, flax, or some other grain before sowing alfalfa again. Some ranch-owners employ extra workmen to sow and harvest the grain. Others rent land in lots of several hundred acres to tenants, who agree to raise certain grain crops for a

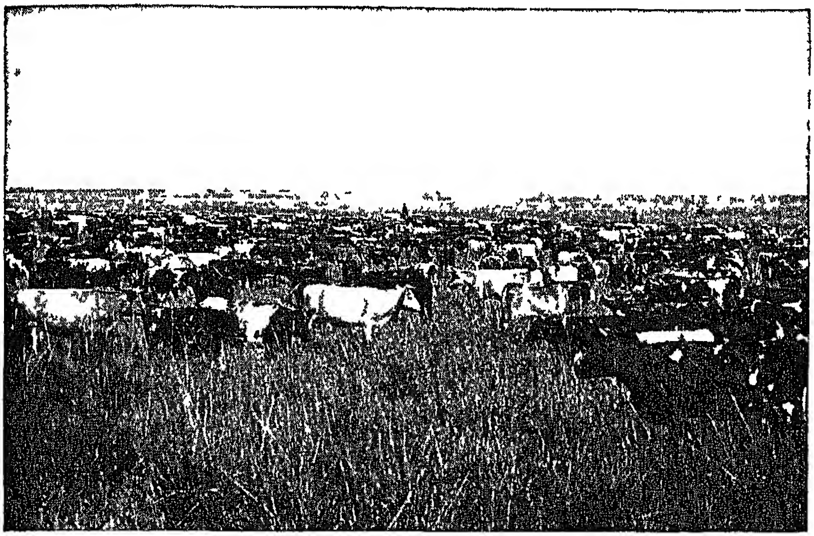
period of four or five years and, at the end of the period, to give up the land, covered with a good stand of alfalfa

Grains as emergency crops Weather hazards furnish reasons for sowing grain on stock ranches. Alfalfa pastures are at their best during the cool, moist weather of spring and autumn. During hot, dry summer weather, and in the colder part of the winter, there may be a shortage of pasture For use in case of a winter shortage, the estate is likely to have several fields of autumn-sown oats into which the stock may be turned for a time To guard against a summer shortage, the stockman plants some drought-resistant crop such as Sudan grass (a grain sorghum) or one of the grasses that formerly grew wild in the area (Fig 351).

Variety within the Pampa A good deal of variety has developed in Pampa agriculture during the last few decades In nearly all cases the very large landholdings are devoted to livestock industries, with grain as a minor interest. Small landowners are more likely to be interested in wheat. The northern half of the Humid Pampa shows somewhat more variety than the area farther south In southern Uruguay and in the Argentine areas tributary to the port of Rosario, corn and flax receive much attention In fact, the northern part of the Humid Pampa, shipping through Rosario and Montevideo, gives Middle Latitude South America its high rank in the export of corn and flaxseed However, wheat, alfalfa, cattle, and hogs all have a place in the farm programs of the northern area

Grazing Lands beyond the Humid Pampa. On the north and west the Humid Pampa is bordered by grazing land North of the grain-producing area in Argentina there is much land subject to annual floods and consequently better suited to grazing than to cultivation. Northern Uruguay belongs to the belt of Atlantic hill country There, and in the neighboring Brazilian state of Rio Grande do Sul, wild grass on flattish hilltops and on the gentler slopes furnishes pasture for thousands of cattle and sheep, and agriculture is restricted to valleys between the hills Uruguayan grazers sell cattle and sheep to packers in Montevideo, and the port of Rio Grande do Sul is one of the major packing centers of Brazil.

Between the Humid Pampa and the foothills of the Andes is the Dry Pampa, represented in oversea trade by merino wool and goat and kid skins. The Dry Pampa supports a scanty vegetation of thorny shrubs, small trees, and harsh bunch grass. Merino sheep roam over



Ewing Galloway

FIG 351 Cattle on rich pasture land of the Humid Pampa

much of the area, providing fine wool for the export trade, but in some localities the pasture is too poor for any livestock but goats

Forest Industries of Atlantic Hills. Because of contrasts in resources, there is much trade between the grain-growing Pampa and the northern forested section of the Atlantic hilly belt Hilly land occurs in Paraguay a few miles east of the Rio Paraguay, and the surface slopes upward to elevations of more than 2000 feet near the coast of Southern Brazil Farms in valleys and lowlands along the coast produce special crops for sale in the coffee region (p 121), but the forest industries find important markets in the treeless Pampa.

Lumber for the treeless Pampa The northern section of the Atlantic hilly belt is an area of abundant rainfall (Fig 349) and well-drained land, where the forest consists of tall trees with a dense undergrowth. The larger trees yield valuable woods, both hardwoods and softwoods. The Paraná pine is valued for general construction purposes, cedar for furniture and interior finishing, and *lapacho* for furniture and wagon wheels Logging camps and sawmills in these forests use methods similar to those of the United States Logs are rafted down forest streams to sawmills, and lumber goes from sawmills to Buenos Aires by rail and by river steamer. The forests of the Atlantic Hills are a major source of lumber for the Humid Pampa,

but they do not furnish the whole amount needed. Argentina also imports lumber from the United States.

Yerba maté for South American consumers Yerba maté is to Middle Latitude South America what tea is to England The beverage is prepared (much as tea is made) from the dried leaves of a native evergreen tree that looks somewhat like an orange tree. The supply comes mainly from the belt of the Atlantic Hills. Argentina, Chile, and Uruguay import thousands of tons annually, Argentina being the largest buyer.

Yerba maté is an important source of income for rural communities in the forested hill country of Paraguay and Southern Brazil The tree belongs to the undergrowth of the Paraná-pine forests, but many farmers of the forest belt have planted yerba maté about their homes. Often the men from these communities go far into the woods and live in camps during the collecting season from May to September, leaving the women and children at home to care for the crops The leaves are dried, packed in bags, and hauled in carts to a river or ocean port where big companies have plants to prepare the leaves for market

Forest Industries of Gran Chaco. In the Gran Chaco, which lies west of the Paraguay River, trees find difficult growing conditions, and the forests are not dense Rains fall in summer and then there follows a dry season of six or eight months, during which the trees drop their leaves The surface is so low and flat that great areas are flooded annually and support a vegetation of grass instead of forests On slightly elevated tracts of ground that rise above flood level, clumps of palms or tall quebracho trees are dotted over the grassy plain.

Most of the forest work of the Gran Chaco has to do with the quebracho trees The quebracho industry has two branches, which are carried on by different companies in different parts of the forest area

Quebracho for tanning material. The export branch of the quebracho industry is in the hands of North American and European companies. It is carried on mainly in a strip of forest 100 to 150 miles wide which lies on the west side of the Paraguay River This strip receives a little more rain than the area farther west, and its quebracho trees are particularly rich in tannin. Here the foreign companies have established factories to extract tannin from the quebracho wood and prepare the extract for shipment. They have built short railway lines

back into the forest to haul logs to the factories. For fuel they use wood from which the tannin has been extracted. River steamers and railways furnish transportation to ports visited by ocean vessels.

Quebracho wood for use in Humid Pampa. The second branch of the quebracho industry belongs to the western part of the Gran Chaco, where the dry season is longer and the forest trees more scattered than near the Paraguay River. Here the quebracho trees rise above a scanty undergrowth of thorny shrubs and cactus. They contain a smaller proportion of tannin than the trees near the Paraguay River, and extract companies have not shown an interest in them. Small logging companies have established sawmills along the few railway lines of the area and furnish fence posts for Pampa ranches, ties for railways, and timber for port works. They also supply fuel for railways and river steamers and charcoal for domestic use. Quebracho wood is excellent for all these purposes, for it is very hard, insects will not eat it, and it can remain in contact with soil or sea water a long time without decay.

3. *The Highland Belt*

Divisions of Highland Belt. The western highlands of Middle Latitude South America are divided unequally between Argentina and Chile. The international boundary runs along the crest of the Andes, and this arrangement gives Argentina the larger area of highland. On the west the highlands slope steeply to the Pacific, where the mountains stand with their feet on the ocean floor and their heads in the clouds (Fig. 352). On the east the slope is somewhat less abrupt. In southern Argentina the plateau of Patagonia extends from the Andes to the Atlantic (Fig. 347). Farther north a broad belt of mountain spurs, foothills, and valleys intervenes between the high mountains and the Paraná Plain.

Chile and Its Longitudinal Valley. Chile lies wholly in the mountains, for it has no coastal lowland except bits of alluvial land at the mouths of rivers that break through the coast range. But between the coast range and the steep wall of the Andes is a long troughlike depression partly filled with alluvium washed down from the mountains. This "longitudinal valley" contains a good deal of level land, though mountain spurs extend into it from either side (Fig. 353). In the north it is desert, but it has valuable minerals. In the south it

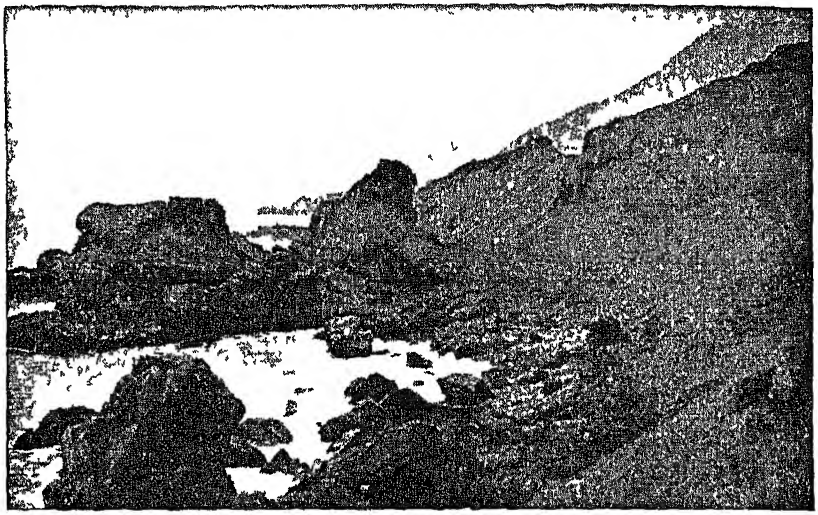


FIG 352 The mountainous coast of Chile north of Antofagasta Back of this range are the nitrate fields and the Chuquicamata copper-mining community Nearly everywhere on the Chilean coast the mountains rise steeply from the sea In many places the rocks have a greenish tinge, suggesting a small copper content, and, in fact, many small copper mines do pierce the slopes of the range

receives enough rain for forests, but its floor is under water In its central portion it receives a moderate rainfall and has an abundance of irrigation water A long railway line (Plate IV) follows the longitudinal valley from the northern boundary of Chile to the point where the valley floor disappears under water

Importance of Central Chile When Chileans speak of their country, in most cases they are thinking of the middle section of the longitudinal valley In spite of its mineral export, Chile is an agricultural country, and Central Chile contains nearly all the farm land It also contains more than three fourths of the people of the country and most of the cities, including Santiago, the national capital. It has several thousand factories making woolen and cotton cloth, flour, leather, airplanes, and other products for domestic use In it are located the headquarters of the companies that operate mines in the north or sawmills in the south

Central Chile is a land of big estates with level wheat fields, irrigated alfalfa pastures, vineyards, and orchards Its farms produce for local markets, for the mining communities of the north, and for the sawmill communities and logging camps of the south

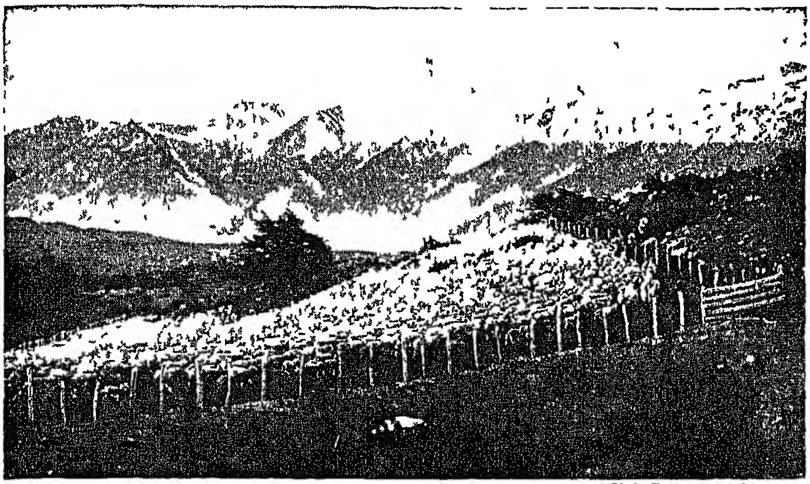

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FIG 353 A sheep ranch in the longitudinal valley of Chile, with the snow-covered Andes in the distance

In addition, minor quantities of farm products go to foreign countries For example, North American cities sometimes get Chilean fruit in winter Wheat occupies more farm land than any other crop The area about Santiago has a climate similar to that of Southern California and grows similar crops under irrigation Among horticultural crops, grapes are particularly prominent, and the area also produces citrus fruits Farther south, where more rain falls, there are extensive grainfields without irrigation

Chile's mineral wealth While Chile's crops are grown mainly for domestic markets, its mines produce chiefly for export Mineral deposits are widely distributed The arid north boasts the famous deposits of Chilean nitrate and the big Chuquicamata copper mine (p 328). The nitrate deposits lie on the floor of the longitudinal valley, and the Chuquicamata copper deposits are in a mountain partly buried by the alluvial material of the valley Near the southern margin of the desert, a North American company mines high-grade iron ore in the coast range for shipment to the United States Many other deposits of iron ore are known, and the country has many small copper mines in addition to its three large mines (p 328). The Braden mine works copper deposits in the high Andes of Central Chile The south has both iron ore and coal, and some ore is smelted at Valdivia for domestic use.

Chile's mineral specialty For a long time the desert of Northern Chile furnished most of the world's nitrate supply for use as fertilizer and for the manufacture of explosives. Then the nitrate communities had a total population of 200,000, and the taxes paid by nitrate-producers covered nearly all the expenses of the national government Both the industry and the government suffered loss when scientists found ways of manufacturing nitrates from the air The Chilean fields now furnish only a small part of the world supply, and there are many idle nitrate plants scattered through a 300-mile strip of desert

In the last few years about half the Chilean output has come from two big new plants, where scientific methods have cut down operating expenses Electric machinery uncovers the layer of nitrate rock (Fig 354), known in Chile as *caliche*, which has a thickness of only about three feet After being shattered by explosives, the caliche is loaded on electric trains by electric shovels and hauled to the crushing plant The crushed caliche is soaked in tepid water to remove the soluble nitrate, and then the liquid, with its nitrate content, is drawn off, leaving the barren rock behind Cooling the liquid causes part of the nitrate to form into crystals, and when these have been removed the liquid is used for another tank of caliche These new methods require fewer workmen than were needed formerly, and also cut down the amount of fuel and water consumed Water and fuel, as well as labor, are expensive in the desert

The Patagonian Upland. The arid plateau of Patagonia produces wool and mutton for export, and not much else. The population is about large enough to place a family of five persons on every ten square miles of land, and sheep-raising is almost the only industry. The greater part of Patagonia belongs to Argentina, but the area bordering the Strait of Magellan is part of Chile (Plate IV).

Handicap of water scarcity Patagonia suffers from scarcity of water Much of the plateau has a desert climate, the annual rainfall averaging less than 10 inches (Figs 349 and 350), and in most places the people have failed in their efforts to obtain water by sinking wells A few streams from the Andes cross the plateau, flowing in deep valleys with level floors These valleys furnish sites for ranch headquarters, giving protection from the strong desert winds (Fig. 4) Streams, springs, or wells provide water for household use, for livestock, and in some cases for irrigating gardens Generally the

flocks consist of many thousand sheep, and each little community is separated from neighbors by many miles of desert, for valley sites are few and far between

Export movement Exports from Patagonia move through a number of small ports From November to May, after the spring shearing season, wool moves to the coast in great wagon trains, for Patagonia has only a few short railway lines Sheep for slaughter are driven to the coast during the same season and sold to big companies that operate packing plants at several of the wool-exporting ports. Both wool and mutton go chiefly to markets in Western Europe

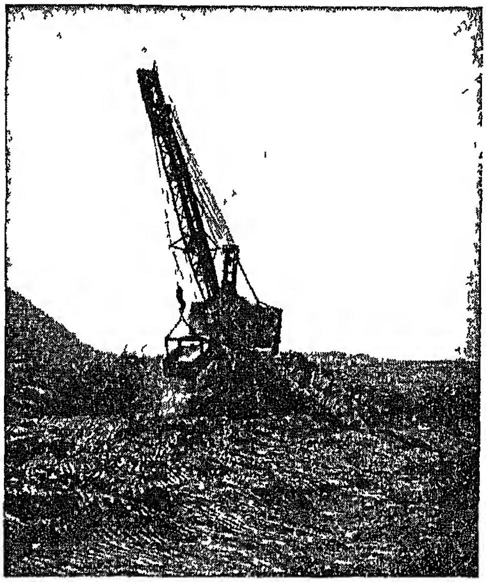


Fig 354 Stripping the overburden from a nitrate deposit in Northern Chile This is one of the world's driest deserts However, if the area were not very dry, the soluble nitrate would have been carried to the sea long ago

Patagonian mineral resources Patagonia has deposits of gold, coal, and petroleum. Its known gold resources are not large Its coal fields lie near the Andes in areas without railroads, hence not much coal has been mined But the petroleum field of Comodoro Rivadavia, located near the coast, is the largest producing field of the country and is of much importance to Argentine industries Crude oil goes by tank steamer to the Rio de la Plata for treatment by up-to-date refineries Many Argentine factories now use petroleum for fuel; others use oil or imported coal, according to the relative prices of the two commodities

The Argentine Piedmont. The rugged area at the eastern foot of the Andes produces a variety of commodities for use in Argentina and contributes something to the export trade It produces a little gold, a little tin, and some petroleum But its principal products come from arid valleys and piedmont plains irrigated by streams flowing from the snowy Andes.

The irrigated oases of the piedmont belt fall into a northern and a southern group, differing in their commercial crops, both groups produce mainly for domestic markets. The oases of the northern group, the largest of which is Tucumán, lie near the margin of the tropical belt and are nearly frost-free. They produce enough cane sugar so that Argentina has a surplus for export (Fig 48). Mendoza and several neighboring oases make up the southern group Having frosty winters, they produce middle-latitude crops Vineyards cover thousands of acres, the grapes being used principally for wine-making

In all cases the oases produce a variety of other crops—oranges in the northern group, peaches in the southern group, alfalfa in both groups. The fruits are consumed principally in Argentina, but some quantities go to foreign countries during the northern winter Alfalfa pastures serve for fattening cattle, and the oases also raise alfalfa seed for sale to ranch-owners of the Humid Pampa

QUESTIONS

1 What five countries lie partly or wholly in the middle-latitude section of South America? Which of these countries extend northward into low latitudes?

2 Which have the highest total value among exports from Middle Latitude South America—products of livestock industries, products of cropland, or products of forest and mining industries (Fig 346)?

3 What striking difference is there between the trade of the Atlantic and Pacific ports of Middle Latitude South America? Suggest a reason for the difference

4 What division of Middle Latitude South America is most productive agriculturally? Which leads in mineral wealth? in forest resources?

5 What types of manufacturing industries in Middle Latitude South America are interested in domestic raw materials and foreign markets? Mention two cities where such industries have developed

6 What manufacturing industries are interested in domestic markets rather than domestic raw materials? Mention three cities where industries of this type have developed.

7 What is Argentina's rank among wheat-exporting countries (pp 228–230)? Where is its crop grown? What neighboring country shares the wheat-growing land?

8 In what way is the Humid Pampa better for agriculture than the area that borders it on the west? than the area south of it?

9 Argentina exports more corn than does the United States, though it produces much less Why?

10 Is corn more important in the northern or the southern half of the Humid Pampa?

11 What bearing has Argentina's large alfalfa acreage on its foreign trade?

12 What oil-yielding grain ranks among the major crops of the Humid Pampa? What are the principal uses of the oil? What Oriental country produces this grain for export (Fig 331)?

13 What types of wood does the Humid Pampa get from the forests of the Atlantic Hills? from the western part of the Gran Chaco?

14 What relation is there between shoe manufacture in the United States and the resources of the Gran Chaco?

15. Why do more people live in Central Chile than in the northern and southern sections of the country?

16 Chile imports bananas What country furnishes its supply (p 81)? Why does Chile not grow bananas?

17 Where are Chile's principal copper mines? Where is most of the copper sold (p 328)?

18 What relation is there between the desert of Northern Chile and the fertility of soils in other parts of the world (pp 36, 272, and 652)?

EXERCISES

1 *Contrasted divisions of Middle Latitude South America*

Make a study of natural conditions in contrasted divisions of Middle Latitude South America Consider the following points

a Which of the world's major river basins does the region contain (Fig 20)? What important agricultural area lies mainly within the basin? What forest areas?

b What two sections of Middle Latitude South America have abundant rainfall (Fig 350)?

c What major land forms are characteristic of these sections (Fig 15)? What types of native vegetation (Fig 24)?

d Which is in lower latitude, the coniferous forest area of the region or the hardwood forest area?

e What part of the region has a moderate rainfall? What major land form is characteristic of that section (Fig 15)? What is its native vegetation (Fig 24)? What bearing has this fact on the quality of the soil (pp 38 and 230)?

f What parts of the region have desert vegetation? Where in the arid sections is water available for irrigation?

2 *Argentina in world trade*

Round out your study of Argentina by bringing together understandings gained from Chapters XLIV-XLV and bits of information gleaned from other chapters The following references will give you a start Add two items to the list and then prepare a second list under this heading—"*b* Argentina as a market"

a Argentina as a source of export commodities
- (1) Wheat (pp 228-230 and Fig 346)
- (2) Corn (Figs 246 and 346—the corn of these two tables is chiefly Argentine corn)
- (3) Meats (pp 244-245, Fig 138—about a fifth of the meat of this table was from Argentina, Fig 346)
- (4) Hides and skins (Fig 30—Argentina furnished about a fifth of the hides and skins of this table)

3 *A desert industry*

Prepare to talk on Chile's distinctive mineral industry Become familiar with the following points before planning the outline for your talk

a The nitrate resource
- (1) The mineral itself—solubility, major uses
- (2) Distribution in Chile and rarity elsewhere

b The desert environment
- (1) Bearing of aridity on existence of the resource
- (2) Nature of country at margins of desert—eastern border (Fig 353) and western border (Fig 352)

c. The mining operations
- (1) Comparison with iron-mining of northern Minnesota (pp 313-314)—surface or underground work, probable necessity for moving machinery often
- (2) Work of machine shown in Figure 354, other operations to follow
- (3) Preparation of nitrate for export—relation of process to soluble nature of mineral

d Trade
- (1) Market regions
- (2) Former importance of the trade and reason for decline

CHAPTER XLVI

AUSTRALIA AND THE WORLD'S WOOL TRADE

1. *International Trade in Raw Wool*

Place of Wool among Textile Fibers. Among the textile fibers of world trade, wool ranks next to cotton in both volume and estimated value of exports Wool-producing countries annually export from 800,000 to more than a million tons of raw wool. Cotton exports amount to three times as much (Fig 355), but since wool prices run about three times as high as cotton prices, there is little difference in the total value of the two commodities All other textile fibers rank far below wool either in export volume or in value

Textile Fibers	Short Tons
Cotton	3 206 000
Wool	1 021 000
Jute	874 000
Flax fiber	345 000
Raw silk	43 000

Fig 355 Total world exports of principal textile fibers in a recent year

Regions Engaged in Wool Trade. Six areas play the major roles in the world's wool trade (Fig 356). Australasia, Middle Latitude South America, and Southern Africa produce about 90 per cent of the world's export wool, and about 90 per cent of the total volume goes to Western Europe, Eastern United States, and Eastern Asia. In general, raw wool moves from regions with small populations to densely peopled manufacturing areas. To a remarkable degree it is produced in the Southern Hemisphere and consumed in the Northern Hemisphere (Fig 357) There are many lesser currents of trade, however About 10 per cent of the world's export wool comes in small lots from widely scattered areas, and 5 or 6 per cent of the total volume goes to countries in Eastern Europe

Principal wool-importing regions. Western Europe ranks first among the wool-importing regions of the world (Figs. 356 and 357) It takes about two thirds of the raw wool of international trade, the greater part going to Britain and the Continental countries that share the International Triangle. In addition, Western Europe uses much

Principal Raw-Wool Exporters		Principal Raw-Wool Importers	
Region and Country	*Exports in Tons*	*Region and Country*	*Imports in Tons*
Australasia		Western Europe	
Australia	456,000	United Kingdom	252 000
New Zealand	111 000	France	169 000
Middle Latitude South America		Germany	145 000
Argentina	150 000	Belgium and Netherlands	64 000
Uruguay	55 000	Italy	57 000
Chile	11 000	Czechoslovakia	18 000
Southern Africa		Switzerland	10 000
Union of South Africa	129,000	Eastern Asia	
Other Southern Africa	2 000	Japan	121 000
Eastern Asia		Eastern North America	
China	21 000	United States	101,000
Manchukuo	3 000	Canada	3,000
Southern Asia		Eastern Europe	
India	26 000	Soviet Union	35,000
Iran Iraq and Syria	14 000	Poland	20 000
All other countries	40 000	Other Eastern Europe	11 000
		All other countries	41 000
Total, all countries	1 018 000	Total all countries	1,047 000

Fig 356 World trade in raw wool during a recent year

home-grown wool, for it has more sheep than either Southern Africa or Middle Latitude South America. It needs large quantities of wool, for its winter temperatures make warm clothing necessary, and the factories of the region make woolen goods for export as well as for local use.

Outside of Western Europe the only important wool-importing countries are the United States and Japan. In some years Japan's wool imports exceed those of the United States, but the United States uses much more wool than Japan. The 52 million sheep in our country yield nearly all the wool needed for clothing material, particularly the finer grades, and therefore our wool imports consist mainly of wools suitable for making blankets and carpets In contrast, Japan has few sheep, and nearly all its wool supply comes from foreign countries

Principal wool-exporting countries In each of the wool-exporting regions of the Southern Hemisphere one country produces at least two thirds of the total wool export (Fig 356) Australia's shipments amount to three or four times those of New Zealand, the only other wool-exporting country of Australasia. Argentina's exports are more

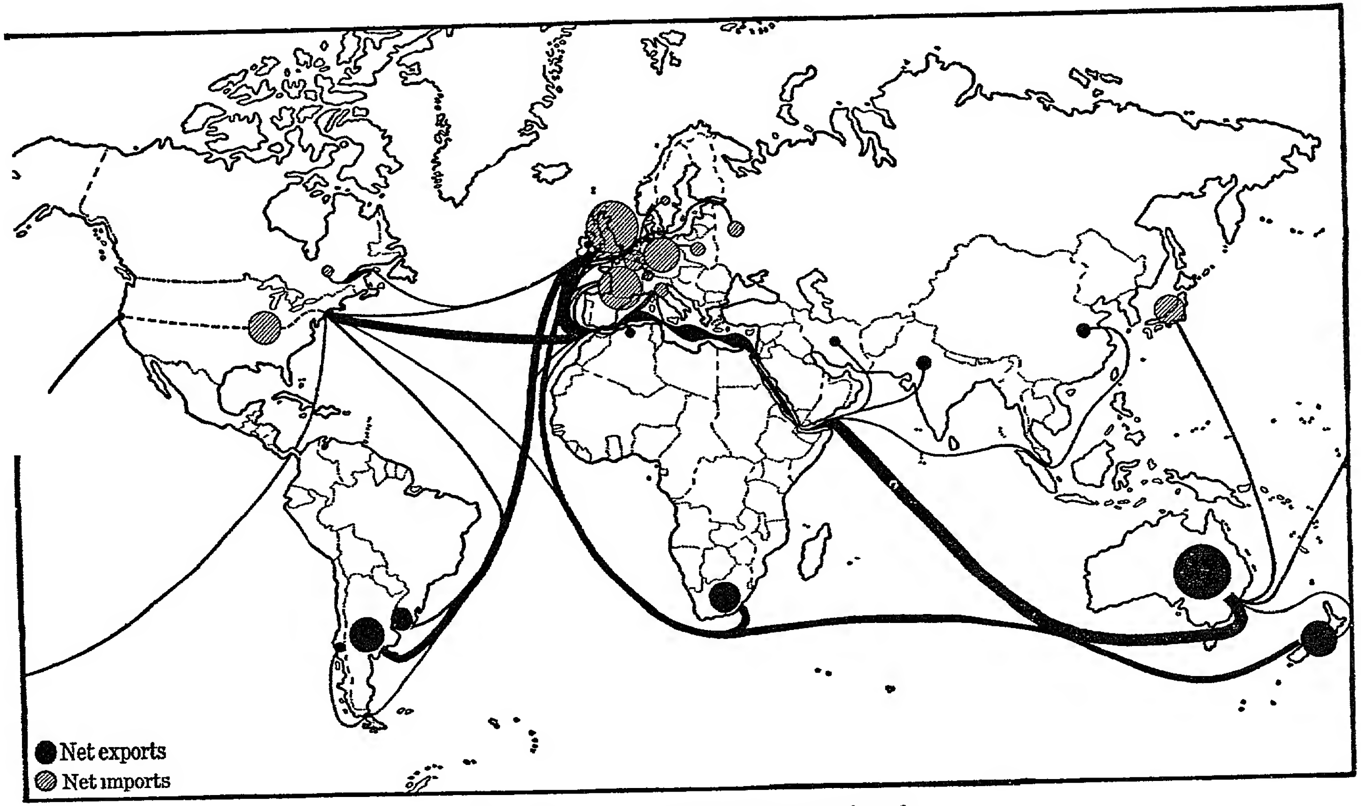


Fig 357 Routes of ocean-borne wool trade

than double those of Uruguay and Chile combined Southern Africa has only one important wool-exporting country—the Union of South Africa—though a little wool comes from neighboring countries Thus the world has just three great wool-exporting countries, and Australia greatly outranks the other two. The importance of wool in Australasia, Southern Africa, and Middle Latitude South America is suggested by the fact that each of these regions contains more sheep than people (In the United States there are more than twice as many people as sheep)

Types of Sheep in Southern Hemisphere Flocks. In the three Southern Hemisphere regions the sheep belong to two types, both of which yield wool of grades wanted in the European Manufacturing Belt The first type is the merino, descended from a fine-wool breed developed in Spain centuries ago Being small and lean, this type does not bring high prices when sold for mutton, but its wool can be spun into finer yarn than that from any other sheep The second type includes a group of double-purpose breeds that yield wool of medium quality and mutton good enough for export. This type has a mixture of merino blood and that of some English mutton breed It yields the "crossbred" wool of commerce, which has longer and coarser fibers than merino. The choicer grades of crossbred wool are suitable for the manufacture of fine worsted materials The coarser grades go to carpet or blanket factories.

Development of Wool Industry. Western Europe is really responsible for the development of the wool industry in Southern Hemisphere regions European settlers introduced sheep-raising into each of the three regions; and the flocks of today are descendants of sheep brought from Western Europe. Each region produces more export wool than the whole Northern Hemisphere, and each produces mainly for the markets of Western Europe

Pioneer stage of wool industry During the pioneer period the sheepmen in each of the three regions were interested mainly in the production of fine wool They first won a place in the world's wool trade by means of their merino flocks. For several reasons the pioneer sheepmen found this a particularly satisfactory breed for their ranges. In the first place, the wool brought good prices. In the second place, a few herdsmen could manage large flocks on the unfenced plains, for merino sheep are not likely to stray away from the flock. In the third place, the merino does well in dry areas, thriving on pastures so

poor that larger sheep would starve Sheepmen with merino flocks pushed the frontier of settlement into sections of Australia, South Africa, and Argentina where too little rain falls for crops The quality of mutton did not worry the pioneer sheepmen, for the slow and irregular transportation of early days did not permit the export of perishable products

Later stage of wool industry Time brought changes. With the installation of refrigeration on ocean vessels came the establishment of packing houses to prepare meat for export Then the sheepmen began breeding for higher mutton value, aiming also for wool of a quality attractive to manufacturers in Western Europe The double-purpose sheep proved valuable for areas with good pastures and good means of transportation to packing centers, but remote sections with scanty rainfall could take little part in the mutton trade Such sections still depend on the sale of fine wool

The later development of sheep-raising has brought out contrasts between the Southern Hemisphere regions that were little noticed at first Australia, with its large area of arid or semiarid grazing land, ships principally fine wool, New Zealand, with its humid climate and rich pastures, takes much interest in the mutton trade and ships crossbred wool. Southern Africa, handicapped by aridity, ships merino fiber Of the wool produced in Middle Latitude South America, more than half is of medium and coarse grades—a fact recalling the rich pastures of the Humid Pampa and the development of meat-packing at Pampa ports Argentina exports some merino wool, which is produced chiefly on the grazing lands of the Dry Pampa and of Patagonia

Minor Sources of Export Wool. The United States gets about 40 per cent of its imported wool supply from northern China, India, and southwestern Asia, though these areas produce only 5 or 6 per cent of the world's export wool Shipments come from scattered areas in the broad belt stretching from Asia Minor to Mongolia and Manchukuo Much of the output comes from the flocks of nomadic people and reaches the sea after a long journey by pack train over desert or mountain trails. The grazing lands of central and southwestern Asia are the world's principal source of carpet wool, and the United States, producing no carpet wool at home, is a valued customer.

The carpet wool exported from central and southwestern Asia consists of fine, kinky fibers mixed with coarse hairs, and is par-

ticularly suitable for the varieties of carpet that have a nap, or pile The hairs make the pile springy, so that it rises quickly after being stepped upon. The quality of the wool reflects the hardships of nomadic life Wandering people have no barns to shelter their flocks, hence the people of central and southwestern Asia have developed breeds capable of enduring severe weather. Their flocks, like the wild sheep described by Marco Polo, have a shaggy growth of hair that hides the inner coat of fine wool This double coat gives much better protection from stormy weather than does the single coat of the European sheep. The mixture of wool and hair makes the Asiatic wool suitable for a special market

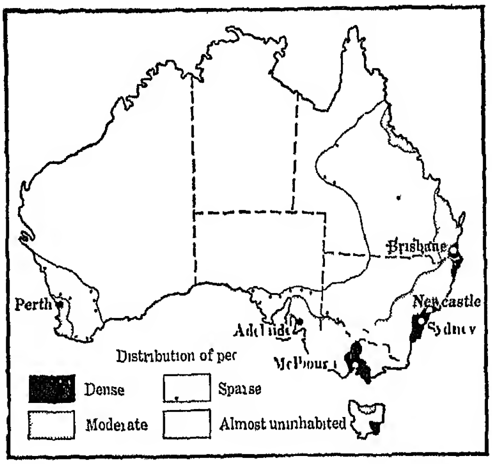


Fig 358 Population density in Australia

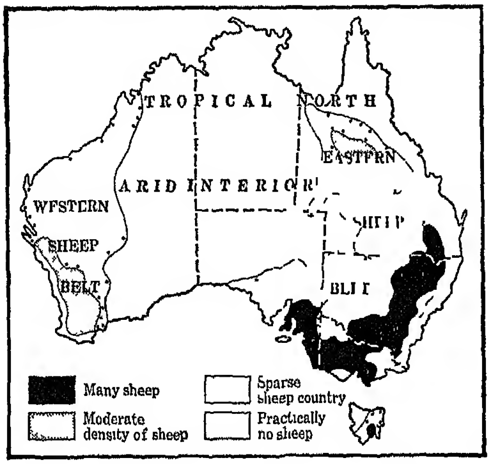


Fig 359 Density of sheep in Australia

2. *Sheep and Wool in Australia*

Importance of Sheep in Australia. It has been said jokingly that Australians do not believe in the existence of any animal except the merino sheep. Certainly Australians have much reason to prize the sheep. In many sections of the country sheep-raising is the only way of making a living. Except for a narrow belt along the Pacific coast, the areas not suitable for sheep-raising are almost without people (Figs. 358–361)

Sheep have great importance in Australia's dealings with other countries Products of the livestock industries exceed in value all other Australian exports combined, and wool accounts for about three fourths of the value of the livestock group (Fig 362). In fact, wool brings in nearly 40 per cent of the income received for all exports. Among meat exports, beef ranks first in quantity, but frozen lamb ranks first in value. In addition, the refrigerator ships carry mutton, pork, rabbit, and poultry. The slaughter of lambs for export has increased much in recent years, and exports of frozen lamb now are two or three times as great as those of mutton

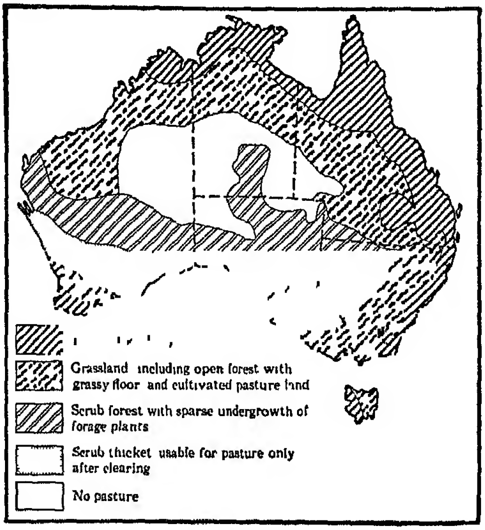


Fig 360 Types of pasture in Australia

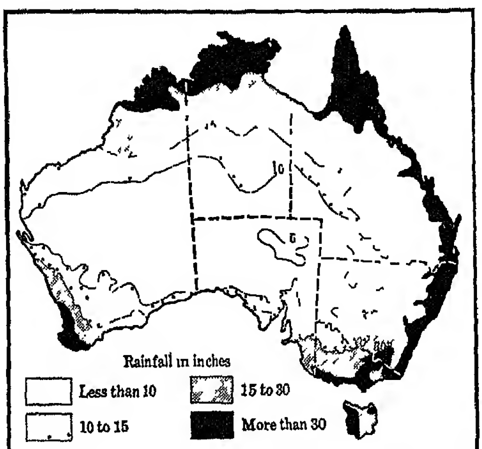


Fig 361. Annual precipitation in Australia

Wool-Growing Areas and Their Limits. Australia has two major wool-producing areas, the Eastern Sheep Belt and the Western Sheep Belt, which together cover less than half the continent (Fig 359) Between them lies a vast area that has repulsed every advance of the sheep-raising frontier. Its weapon is aridity, for the annual rainfall averages from 10 inches to less than 5 inches (Fig. 361), and years may pass without a single shower. Plants cannot grow without water, and sheep cannot live without vegetation.

Principal Exports	Value	Value
Products of livestock industries		$265,000,000
Wool	$207 000 000	
Meats	33,000,000	
Hides skins, and leather	25,000,000	
Grains and flour		75 000,000
Wheat	56 000 000	
Flour	18 000 000	
Barley	1 000 000	
Products of specialized agriculture		71 000 000
Dairy and poultry products	43 000 000	
Fruits	19 000 000	
Cane sugar	9 000 000	
Minerals and ores		68 000,000
Gold	37,000 000	
Lead	15,000 000	
Zinc and concentrates of zinc ore	6 000,000	
Silver	3 000 000	
Other metals and ores	7 000 000	
All other exports		38,000 000
Total value of exports		517,000,000

FIG 362 Principal groups of commodities exported from Australia in a recent year

The Eastern Sheep Belt. About 90 per cent of Australia's wool clip comes from a belt of country 200 to 300 miles wide that runs nearly parallel to the eastern coast. From Victoria and the Adelaide section of South Australia the Eastern Sheep Belt extends through New South Wales and far into Queensland (Fig 359) Its seaward margin lies 50 to 150 miles from the Pacific shores At the north it gradually gives way to sparse cattle country (Fig. 363), and on its inland margin it merges into the empty desert.

Location with reference to highland The Eastern Sheep Belt occupies the inland slope of the range that borders the Pacific coast From the highland summit the surface gradually descends to the Darling River and the plain about Lake Eyre. Sheep-raising spreads far over this broad slope Its principal stronghold is the belt within 150 to 200 miles of the mountains, but it extends to the smoother and less rainy summit areas, and far inland it struggles with the problems of water scarcity on the desert border

Principal subdivisions. The Eastern Sheep Belt includes three major subdivisions Climate and native vegetation differ from one area to another, and consequently the problems and methods of the wool-

growers differ In the *Wool-Wheat Subdivision* sheep-raising is associated with crop production On the *Desert Scrub Grazing Lands* of the interior the ranches produce fine wool for export and almost nothing else The *Queensland Sheep and Cattle Country* consists of rolling plains covered with tropical bunch grass and utilized for both sheep and cattle

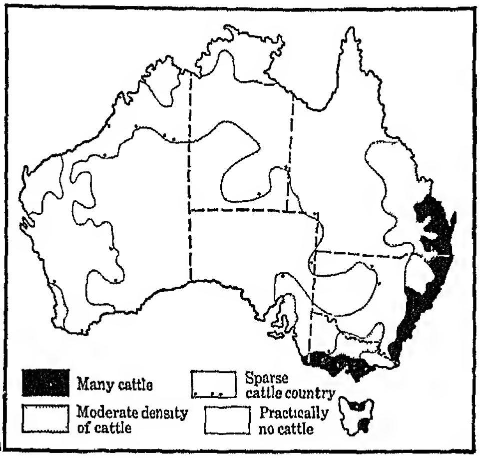


FIG 363 Density of cattle in Australia

The Wool-Wheat Subdivision. Extending in a northeast-southwest direction from southeastern Queensland through New South Wales to the Adelaide section of South Australia is a strip of country that surpasses the rest of the Eastern Sheep Belt in both quantity and variety of production It supports an average of more than a hundred sheep per square mile, and in some localities the density rises to three or four times the average. This high-grade sheep country covers much the same area as the principal wheat belt (Figs 364 and 365) Besides wool and wheat it furnishes fat sheep and lambs for the meat trade Furthermore, it includes many small irrigated districts that produce alfalfa for feeding dairy cattle; oranges, orchard fruits, and rice for domestic consumption, and raisins for export

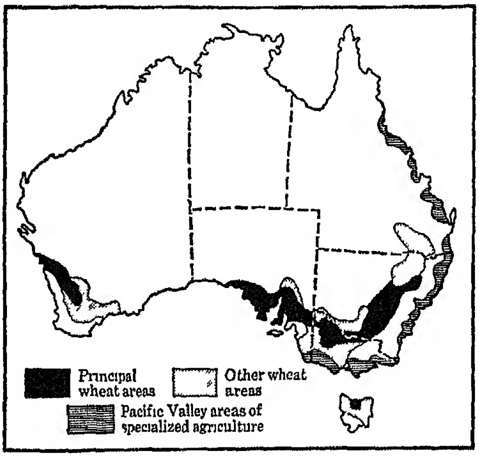


FIG 364 Wheat-growing areas of Australia

Natural advantages for sheep industry The density of sheep in the Wool-Wheat Subdivision reflects certain natural advantages over

FIG 365 Delivering bagged grain at a railway station in the wool-wheat area of Australia The broad open spaces, the numerous trees, and the unpaved streets suggest the youth of this rural collecting center The piles of bagged wheat hide the railroad at the right

neighboring areas This subdivision has mild winters, a moderate rainfall evenly distributed throughout the year (Fig 366), and a rolling surface that gives good drainage. The rain-bearing winds from the Pacific drop most of their moisture on the sea-facing slope of the highland, but some clouds pass the summit and bring rain to the inland slope (Fig 361 and Plate IX) In the central part of the wool-wheat area the annual rainfall averages about 20 inches, whereas in the coastal belt it averages from 30 to more than 50 inches, and on the inland slope the rainfall decreases with distance from the highland summit (Figs 361 and 366). Sheep are less subject to disease in the sunny and well-drained wheat country than in the rainy coastal belt, and feed is more plentiful there than on the dry plains farther inland

Feed available for sheep There is a good deal of wild pasture available in the wheat-growing areas The native vegetation is open forest with grassy floor, and in some places it is chiefly grass with scattered patches of trees (Fig 360). In contrast, neither the dense forest of the coastal belt nor the scrub forest of the desert border offers abundant supplies of grass. Sheep-raising benefits also from the fact that the wool-wheat area is level enough and humid enough for agri-

culture, since the farms produce feed for sheep as well as grain for export Hay in Australia is generally oats or some other grain crop cut while green In addition to cultivating grain and feed crops, the farmers have improved the unplowed pastures by sowing clover and other pasture plants with the wild grasses

Double purpose in sheep industry Sheepmen in the wool-wheat area manage their flocks so that they take part in both the fine-wool trade and the meat trade The area is dry enough for the merino, and a plentiful year-round supply of feed makes the keeping of mutton breeds feasible The wool clip is almost wholly merino, but mutton breeds and crossbred sheep are present in the flocks.

The following practice suggests one way in which the sheep industry is adapted to a double purpose—the sale of wool and the sale of lambs On many farms where the flocks consist almost wholly of merino sheep, there are also some rams of English mutton breeds, whose wool makes up only a small part of the clip The increase in the flocks includes both merino and crossbred lambs. The merino lambs find a market in the Desert Scrub Grazing Lands and the Queensland Sheep and Cattle Country In those subdivisions drought often causes the loss of sheep, and the owners buy lambs to replenish their flocks The crossbred lambs grow rapidly and are sold for slaughter The sheep remaining on the farm for shearing are mainly of merino breeds

Desert Scrub Grazing Lands. Between the wool-wheat area and the empty interior of the continent stretches a broad belt of scrub forest which supports a sparse population dependent on sheep for a living (Figs 360, 358, and 359). The average amount of rain is small (Figs. 361 and 366), and droughts occur frequently, sometimes lasting for several years The ranches produce merino wool for sale, and almost nothing else Science has found no crops that will thrive there, and the native pastures do not furnish feed suitable for mutton breeds of sheep

Pasture of the desert border The Desert Scrub Grazing Lands produce two types of feed—grass and bushes The vegetation consists of low-branching trees with a scant undergrowth of gray-leaved evergreen bushes When rain falls, grasses spring up between the bushes, and the flocks find good pasture for a while. Unfortunately, rains do not fall regularly enough to make this forage dependable Every ten-year period is likely to have at least one serious drought

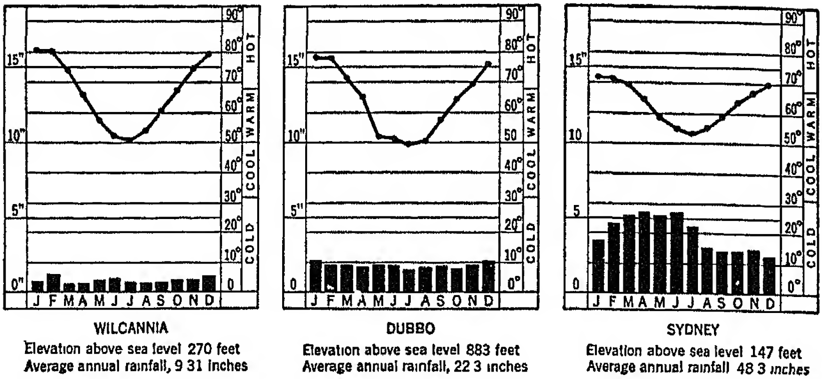


FIG 366 Temperature and precipitation in contrasted sections of New South Wales Wilcannia, on the west bank of the Darling River, is in the Desert Scrub Grazing Lands, Dubbo, on the gentle western slope of the highland, is in the wool-wheat area, and Sydney is on the Pacific coast, where the rainfall is heavy enough and regular enough for forests

and two or three others of shorter duration For several years the soil may remain so dry that grass seeds do not sprout During such times the sheep feed upon the leaves and young shoots of the bushes and even the leaves and seedpods on the lower branches of certain trees. Without this reserve supply of rather harsh feed the sheep would starve

Carrying power of scrub-forest pasture Unreliable growing conditions make it necessary for each ranch in the Desert Scrub Grazing Lands to have a large area in proportion to the number of sheep. Near the border of the wool-wheat area, the land may carry 50 sheep per square mile, but west of the Darling River the carrying power is much less. In some of the better parts of the area north of Adelaide, ranch-managers find that the bush vegetation on a square mile of land will feed 20 to 25 sheep through a series of dry years The pastures might feed twice as many in years of average rainfall, but the trees and bushes grow slowly at any time, and during a severe drought they may stop growing altogether until the supply of ground water is renewed. Too close grazing during a drought would kill many of the bushes and injure the pasture permanently. Thus on the desert border a piece of land as big as an American Corn Belt farm produces feed for five or six sheep and nothing else

A sheep ranch on the desert border. In the Desert Scrub Grazing Lands a sheep ranch may be as large as a Corn Belt county, and only

a few contain less than 10 square miles. Fences of woven wire divide the land into pasture lots as big as American townships, and wells or reservoirs supply the stock with water Generally three or four families and eight or nine unmarried men live on the ranch to care for the sheep and keep the fences in repair Because these people live far from towns or neighbors, the settlement has its own school, store, blacksmith shop, and other conveniences of community life. Generally the people irrigate gardens with water from wells in order to have fresh vegetables for their own use, but water is too scarce for use in irrigating pastures or grainfields

Queensland Sheep and Cattle Country. The Queensland Sheep and Cattle Country consists of gently rolling grasslands, with a few trees growing along stream courses Ranches are large Flocks of sheep and herds of cattle graze in fenced pastures, and several thousand artesian wells provide water for them Except in a small area where the wheat belt extends across the boundary from New South Wales (Fig 364), the Queensland Sheep and Cattle Country does not produce crops Thus the sheep and cattle depend upon wild vegetation for feed

Queensland produces only a third as much wool as New South Wales, but about half of Australia's export meat comes from packing plants in Brisbane, Townsville, and other ports on the Queensland coast These plants receive livestock from Queensland pastures and also from the belt of sparse cattle country in the Tropical North (Figs. 359 and 363)

Seasonal nature of pasture The amount and quality of feed on the plains of Queensland vary with the season. These plains lie on the margin of the tropical belt and have a summer rainy season that lasts about four months (Fig. 367). The annual rainfall averages from 15 to 25 inches Soon after the summer rains begin in December, the perennial grass roots send up new leaves and the plains furnish good pasture. Streams rise and overflow broad, flat areas near the western border of the state, and there the pasture soon becomes rich enough for fattening cattle The rainy season ends in March, and hot weather continues during the early part of the dry season The grass stops growing and gradually dries, forming "natural hay" By August the plains are as yellow as a field of ripe wheat The cattle and sheep subsist on the dry natural hay until December again brings rain.

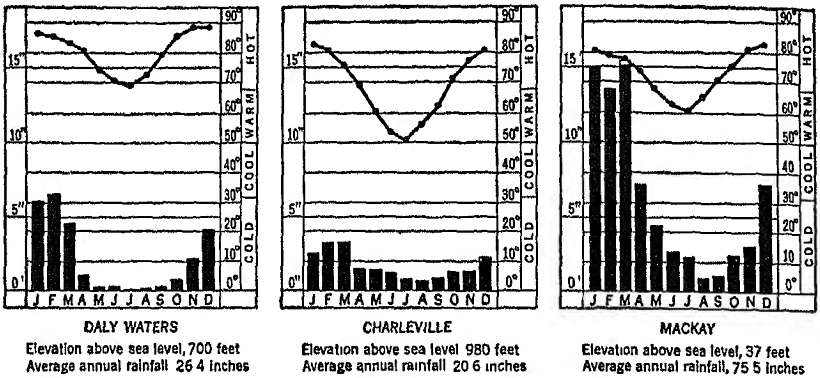


Fig 367 Temperature and precipitation at Daly Waters, Charleville, and Mackay, Australia Daly Waters is in the sparse cattle country of the Tropical North, Charleville is in the Queensland Sheep and Cattle Country, and Mackay is in a sugar-cane district on the Queensland coast Daly Waters and Mackay both represent tropical areas, while Charleville is about as far from the equator as is the Rio Grande Delta of Texas and Mexico

Seasonal rainfall a handicap for meat-packing Droughts and the annual dry season affect the prosperity of the meat-packing plants in Brisbane, Townsville, and other Queensland ports In drought years, when streams do not overflow, the pastures of western Queensland are not rich enough to fatten cattle In years of average rainfall the natural hay of the plains keeps cattle and sheep in fair condition, but it is not rich enough for fattening them or for the rapid growth of young stock. In central Queensland the cattle are not ready for slaughter until they are four or five years old, and most of those received at Townsville plants are five or six years old Tender beef comes from younger stock

London prices reflect the unsatisfactory conditions under which the Queensland meat-packing industry operates. British importers pay twice as much for Argentine beef as for the Australian product. Consumers prefer tender meat from well-fed young stock, and conditions for producing beef cattle in northern Australia are greatly inferior to those of the Argentine Pampa.

Hazards Faced by Wool-Growers. Wool production in the Eastern Sheep Belt faces many threats to its prosperity. Fashion changes affect the price of fine wool, a widely distributed fly spreads disease among the flocks, wild dogs that breed in the sparse cattle country of the Tropical North invade the ranches, and sometimes sheep are

trapped in the path of floods caused by unexpected storms in the semiarid grazing lands However, the two major worries of the sheep-owners are droughts and rabbits

Losses caused by drought Years of scanty rainfall occur frequently in the drier parts of the Eastern Sheep Belt, causing heavy losses For example, a severe and widespread drought in 1935 caused the death of more than a fifth of all the sheep in Queensland, and in some districts nearly a third of the sheep died Ranches on the Queensland plains have no way of storing feed for dry years, but during the 1935 drought a few ranch-managers were able to save their flocks by bringing in feed from the humid farming districts on the coast. Others shipped their flocks by rail or truck to localities where rain had fallen Such measures are not possible for all, and at best they cut down the profits of sheep-raising.

The rabbit pest The timid and gentle rabbit has become a formidable enemy of the sheep in Australia Nearly a hundred years ago English settlers turned imported rabbits loose in southern Victoria, thinking to provide game for future sport Soon the neighboring countryside was overrun with rabbits Hunting expeditions failed to keep them from spreading Later, rabbit-proof fences were built to protect the pastures, but they also failed The rabbit has spread over nearly the whole country, and Australians estimate that the pest has reduced the carrying power of the pastures by a fifth. Ten rabbits are said to eat as much grass as a sheep Furthermore, they injure the pastures permanently, killing some of the best grasses by keeping them cut to the ground, and killing valuable trees by eating the bark Australia annually exports a million dollars' worth of frozen rabbit meat and many millions of rabbitskins, but the annual slaughter seems not to reduce the total number of rabbits in the grazing districts

The Western Sheep Belt. The wool-producing area of Western Australia (Fig. 359) resembles the Eastern Sheep Belt in many ways, though it is much smaller. It includes a humid section in the southwestern corner of the continent, with densely forested slopes facing the sea. Farther inland, sheep-raising and wheat-farming go hand in hand, while orchards and vineyards grow in favored localities. Western Australia produces a fifth of the country's wheat crop but less than a tenth of the wool clip. In the southwest the rainfall varies relatively little from year to year, and wheat thrives under an average

annual rainfall of 12 inches, which is too little for agriculture in the east. Sheep-raising extends far beyond the borders of the crop-growing area, threatened by drought and by the grass-eating rabbit in the sparsely settled grazing lands.

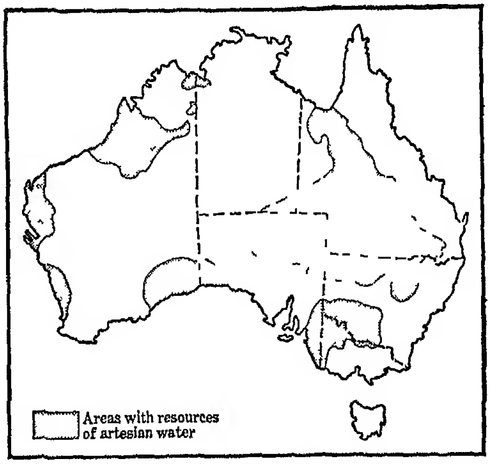


Fig 368 Artesian-water resources of Australia

Fig 369 Cropland and railways in Australia

Utilizing Water Resources in the Grazing Lands. In their attempts to overcome the handicap of water shortage, individuals and state governments draw upon two general sources of supply, ground water and the water of streams. Australian grazing areas contain thousands of artesian wells (Fig. 368), with depths ranging from less than a hundred feet to more than a mile About half are flowing wells, while in others the underground forces raise the water only part way to the surface and pumping is necessary. Dams built in mountain valleys of Victoria and southern New South Wales (Fig 370) store stream water for distribution to land in the Murray Basin during the dry weather of summer. A similar reservoir in the hills back of Perth stores water from the dependable winter rains These improvements do much for the areas they serve, but they are only a "drop in the bucket" so far as the needs of the vast thirsty grazing lands are concerned, and no way has been found to make the arid interior habitable.

FIG 370 The valley of the Murrumbidgee River where the valley now is flooded by the reservoir back of Burrinjuck Dam The dam is located on a branch of the Murray in the mountains of New South Wales, some 30 miles northwest of the national capital The reservoir, completed in 1927, holds back the runoff from a considerable area of forested mountain country It supplies water for orchards, vineyards, citrus groves, alfalfa pastures, and rice fields on the drier margin of the wheat-wool area of New South Wales

Australian Wool from Pasture to Port. In the sheep country the greatest commercial activity occurs during spring and early summer In preparation for the wool harvest, flocks from various pasture lots are assembled at ranch headquarters A little later, wool moves from scattered ranches to a few major commercial centers for sale and export. Australia exports wool in all months, but nearly three fourths of the total is loaded on ocean vessels within the six-month period from October through March

Wool harvest In the southern half of Australia, as in most wool-producing countries, shearing is a spring task. The sheep's coat varies in thickness with the seasons, and shearing is timed to precede the spring shedding, which reduces the coat to summer weight This seasonal work is done by crews of skilled workers who travel from ranch to ranch according to schedules planned by officers of their labor unions. They move from north to south with the advance of

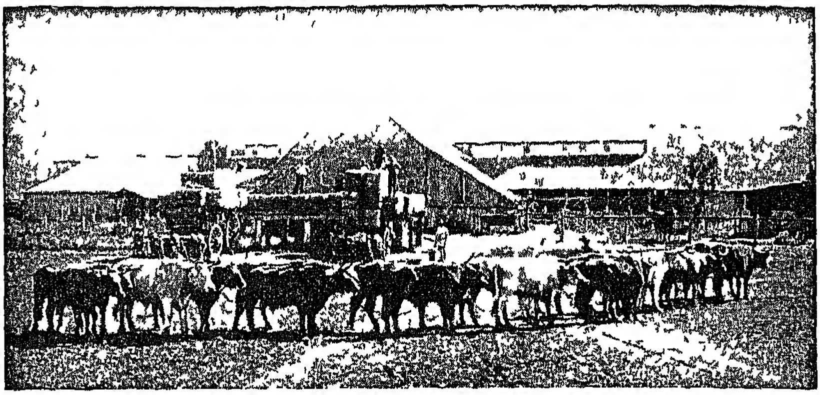


FIG 371 A wool shed on an Australian sheep ranch In front of the shed, workmen are loading baled wool for shipment by ox-drawn wagons to the nearest rail or river station

spring into higher latitudes In June they are busy in southern Queensland, where the latitude is comparable to that of southern Florida, by September they have made their way across New South Wales to the Victoria boundary; and by the end of December they have reached the coast In some localities the sheep are shorn again in the fall. The principal part of the Western Sheep Belt lies in the same latitude as southern Queensland and New South Wales, and there the shearing season covers the months from the middle of June to late September

The equipment of an Australian sheep ranch includes costly provision for the shearing season The group of buildings at the headquarters of every ranch includes a big, low wool shed (Fig 371), with rows of power-driven clippers, for machine shearing is the general practice. The shed contains special tables where trained wool-classers trim the fleece and separate the wool from different parts of the sheep's body according to quality It also contains power presses for making the wool into compact bales and covering the bales with burlap The ranch provides living quarters for the shearing crews. In spite of the fact that these quarters are vacant most of the year, government regulations demand that they be provided with shower baths

Assembling points for export wool. The movement of wool to the seaboard focuses on six major ports Brisbane, Newcastle, Sydney, Melbourne, and Adelaide are spaced irregularly along the southeastern coast, opposite the wool-producing belt. Perth is opposite the

Exported to	Tons
Britain	142 000
Belgium and Netherlands	57 000
France	49 000
Germany	39,000
Italy	21 000
Japan	100,000
United States and Canada	7 000
All other countries	11 000
Total wool exports	426 000

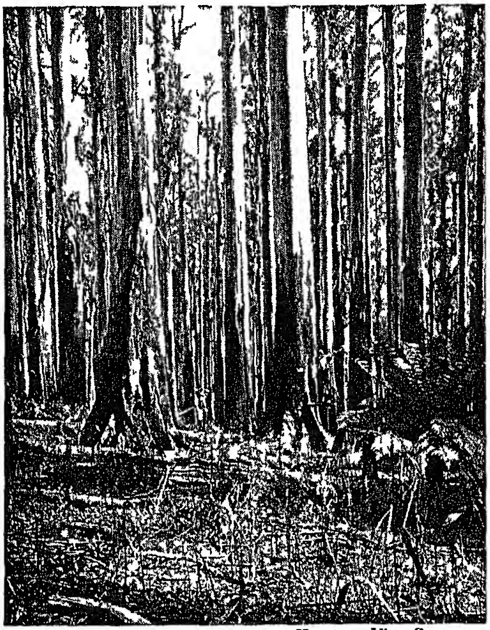
FIG 372 Principal buyers of Australian wool—average for a recent five-year period

denser part of the Western Sheep Belt From each of these cities railway lines lead inland, branching to form a fairly dense net in the crop-growing areas, and sending long arms into the "sparselands" beyond (Fig 369) Sydney ranks first among the six ports, handling more wool than any two of the others

Transportation to port Most Australian wool travels to the seaboard by road and railway, although some shipments go by water From ranch to loading station on railway or river the bales are hauled in team-drawn wagons or by motor truck In the crop-growing areas the haul to a railway is generally less than 20 miles, but from a ranch on the desert border the haul may be more than 100 miles. From some of these remote ranches the wool wagons are drawn by teams of camels The Darling River flows through sheep country with few railways, and barges carry much wool down that river and the lower Murray to Adelaide in seasons when the water has sufficient depth

Principal Destinations of Australian Wool Shipments. More than 90 per cent of Australia's export wool goes to Western Europe and Japan (Fig. 372) Most of the wool is sold before leaving the country In August or early September, buyers from Britain, France, Japan, Germany, the United States, and other wool-importing countries arrive in Australia They come for the wool auctions held in Sydney and other wool centers on certain dates from September to March Britain is by far the largest buyer of Australian wool, taking about a third of the total Japan ranks second among customer countries, but the United States buys little Australian wool The movement from Australia to Western Europe makes up the largest single movement of raw wool in the world.

Interest of Coastal Belt in Grazing Lands. In spite of Australia's large interest in sheep and wool, half the people of the country live in the coastal strip along the Pacific, where wool production does not thrive. This lowland contains five of the six major cities, it supports an increasing variety of manufacture, it includes important areas of specialized agriculture, and it has rich hardwood forests (Fig 373) Nevertheless, the success of wool production beyond the mountains has much bearing on the prosperity of both cities and rural communities in the coastal belt



Keystone View Company

FIG 373 A eucalyptus forest on the lowland east of Melbourne Eucalyptus forests furnish practically all the hardwood needed in Australia, but the country imports softwoods from Scandinavia and Canada

Dependence of coastal cities on interior The business of the cities along the Pacific coast of Australia is largely concerned with the interior of the continent Wool sales, wool export, and meat-packing rank high among the interests of Brisbane, Newcastle, Sydney, Melbourne, and Adelaide All these cities are ports, and four of them are state capitals, concerned with the welfare of the interior as well as the local area. The ports also have factories which manufacture articles needed in the country, such as iron and steel, railway equipment, building materials, clothing, and foods The highland contains coal, and the principal mines are within 100 miles of Sydney, the center of the principal manufacturing district

Specialized agriculture of Pacific valleys. Special crops, grown mainly for domestic markets, interest people in the lowlands along the Pacific coast. The highlands stand near the coast and send forest-clad spurs to the shore. Each river valley forms a separate agricultural district, and the alluvial lands at the mouth of the river form the heart

of the district The northern valleys are tropical, those of the south produce middle-latitude crops

Agricultural valleys on the Queensland coast and in the extreme northern part of New South Wales grow sugar cane, pineapples, and other tropical crops. The principal sugar districts are north of the tropic of Capricorn, where summers are hot, with abundant rain, and where winters are dry and frost-free (Fig 367). Harvest begins in the cooler season, lasting from June to December Raw sugar goes to Sydney for refining and distribution to domestic markets.

Dairy farming is the most widespread industry of the southern valleys, extending from Adelaide to southern Queensland The dairy farms produce fresh milk and cream for near-by cities, and butter and cheese go to both domestic and oversea markets The most important dairying districts are in Victoria and New South Wales, where summer temperatures are moderate and the regular rainfall keeps the pastures green throughout the year (Fig 366) Coasting steamers enter the rivers to collect dairy products for transportation to Sydney, the principal exporting and distributing center of this remote continent

QUESTIONS

1 What two countries make up Australasia? Which is farther from the Suez Canal? from the Panama Canal?

2 What four countries together furnish more than 80 per cent of the world's export wool? How many of the four are in the Southern Hemisphere?

3 The United States contains more sheep than either Argentina or the Union of South Africa Why is it not a major wool exporter?

4 About what part of Britain's imported wool comes from Australia—half, a quarter, nearly all (Figs 356 and 372)? Through what port does Australian wool enter England (p 448)?

5 How do the wool imports of the United States compare in amount with those of Japan (Fig 356)? Is the same statement true of the wool consumption of the two countries? Explain

6 Why do New Zealand flocks contain a larger proportion of crossbred sheep and a smaller proportion of merinos than those of Australia?

7 About what part of Japan's imported wool is from Australia? About what part of the wool imported into the United States comes from Australia? Suggest reasons for the contrast

8 Which have the higher total value among Australian exports, products of cropland or products of livestock industries? How is this fact related to climate?

9 Which have more sheep per square mile, the wheat-growing areas of Australia or the areas not suited to wheat? Why?

10 Why has grazing not spread to the interior of Australia? Explain how this condition has kept sheepmen out

11 Why are landholdings in the Desert Scrub Grazing Lands larger than those of the wool-wheat area? What harm results from keeping too many sheep on the semiarid pastures?

12 What part of Australia is tropical, the north or the south? Which are more important in the tropical area, sheep or cattle?

13 What striking differences are there between the industries of Queensland and those of New South Wales?

14 What relation is there between the world's fur trade and the difficulties of Australian sheepmen?

15 Describe the wool harvest The wheat harvest of North America migrates from south to north during the season June to September Is this true also of the Australian wool harvest? Explain

16 What Australian ports ship wool? What provisions have they made for marketing wool?

17 Why will London importers not pay as much for Australian beef as for beef from Argentina?

18 Account for the development of manufacturing in Sydney What are some of the major lines of manufacture?

19 Does Australia produce cane sugar or beet sugar (Fig 48)? Is it a major or minor sugar-producing country? Where are its sugar lands?

EXERCISES

1 *Countries interested in wool trade (Fig 356)*

Make two multiple-unit graphs to show the principal wool-exporting countries and the principal wool-importing countries Take data from Figure 356

a Principal wool-exporting countries

Let one sheep  stand for 25,000 tons of export wool or remainder equal to more than half this amount

b Principal wool-importing countries

Let one bale  stand for 25,000 tons of imported wool or remainder equal to more than half this amount

2 *Winter-wheat areas in two hemispheres*

Compare the Corn and Winter Wheat Belt of the United States, the Humid Pampa of Argentina, the Wheat Belt of Eastern Europe, and the Wool-Wheat Division of Australia Refer to Figures 128 (Mount Vernon), 349 (Arias), 288

(Bucharest), and 366 (Dubbo) for information regarding temperature and precipitation Consider the following points in your comparison

a Seedtime (assume that sowing takes place in the first autumn month with an average temperature below 70 degrees F)

b Winter rainfall

c Winter temperature

d Time of harvest (assume that harvest takes place in the hottest months)

e Size of domestic market (based on total population of the country)

f Distance from an exporting port

g Distance from markets of Western Europe

APPENDIX

GENERAL REFERENCE LIST

Abstract of the United States Census Issued about three to four years after each decennial census

Agricultural Statistics (Annual) United States Department of Agriculture

Biennial Census of Manufactures United States Bureau of the Census

The Canada Year Book (Annual) Dominion Bureau of Statistics, Ottawa

Foreign Commerce and Navigation of the United States (Annual) United States Department of Commerce

Foreign Commerce Yearbook (Annual) United States Department of Commerce

International Yearbook of Agricultural Statistics (Annual) International Institute of Agriculture, Rome

Minerals Yearbook (Annual) Bureau of Mines, United States Department of the Interior

The New International Year Book (Annual) Funk & Wagnalls Company, New York

The Statesman's Year-Book (Annual) The Macmillan Company, New York

Statistical Abstract of the United States (Annual) United States Department of Commerce

Statistical Year-Book of the League of Nations, Geneva, Switzerland

The World Almanac and Book of Facts (Annual) The New York World Telegram, New York

World Economic Review (Annual) United States Department of Commerce

Yearbook of Agriculture (Annual) United States Department of Agriculture

NATIONS OF WESTERN EUROPE AND THEIR COLONIES[1]

BRITISH LANDS

Europe

- Eire
- Gibraltar
- Great Britain (England, Scotland, and Wales)
- Malta
- Northern Ireland

The Americas

- Bermuda Islands
- British Guiana
- British Honduras
- British West Indies
- Canada
- Falkland Islands and South Georgia
- Newfoundland and Labrador
- Trinidad Island

Africa

- Anglo-Egyptian Sudan
- Ashanti and Gold Coast
- Bechuanaland
- British Somaliland
- Cameroon and Togoland
- Gambia
- Kenya
- Mauritius Island
- Nigeria
- Northern Rhodesia
- Nyasaland
- St Helena and Ascension
- Seychelles Islands
- Sierra Leone
- Southern Rhodesia
- Southwest Africa
- Tanganyika
- Uganda
- Union of South Africa
- Zanzibar Island

Asia

- Aden, Perim, and Protectorate
- British Borneo, Brunei, and Sarawak
- British Malaya
- Burma
- Ceylon
- Cyprus
- Hong Kong
- India
- Palestine
- Trans-Jordan

Australasia

- Australia
- New Zealand
- Pacific Islands
- Papua
- Territory of New Guinea

FRENCH LANDS

Europe

- Corsica
- France

The Americas

- French Guiana
- French West Indies
- St Pierre and Miquelon

Africa

- Algeria
- French Equatorial Africa
- French Somaliland
- French West Africa
- Madagascar
- Morocco
- Reunion Island
- Togo and Cameroun
- Tunisia

Asia

- French India
- French Indo China
- Syria and Lebanon

Oceania

- French establishments in Oceania
- New Caledonia
- New Hebrides

ITALIAN LANDS

Europe

- Albania
- Dodecanese Islands
- Italy
- Sardinia

Africa

- Eritrea
- Italian Somaliland
- Libya

DUTCH LANDS

Europe

- Netherlands

The Americas

- Curaçao Island
- Netherlands West Indies
- Surinam (Dutch Guiana)

Asia

- Netherlands Indies

PORTUGUESE LANDS

Europe

- Portugal

Africa

- Angola
- Cape Verde Islands
- Mozambique
- Portuguese Guinea
- Prince's and St Thomas islands

Asia

- Macau
- Portuguese India

Oceania

- Timor Island

DANISH LANDS

- Denmark
- Faroe Islands
- Greenland

SPANISH LANDS

Europe

- Spain

Africa

- Canary Islands
- Fernando Po, Annobon, and other islands in Gulf of Guinea
- Ifni
- Rio Muni
- Rio de Oro and Adrar
- Spanish Morocco

BELGIAN LANDS

Europe

- Belgium

Africa

- Belgian Congo

[1] For areas and populations of principal countries see pages 683–684

AREAS AND POPULATIONS OF THE PRINCIPAL COUNTRIES

NORTH AMERICA

	Area in Square Miles	Population		Area in Square Miles	Population
Alaska	586,400	72,524	Honduras	44,275	962,685
British Honduras	8,598	56,893	Labrador	110,000	4,716
Canada	3,694,863	11,506,655	Mexico	763,944	19,154,092
Costa Rica	23,000	591,862	Newfoundland	42,734	289,588
Cuba	44,164	4,108,650	Nicaragua	60,000	1,133,572
El Salvador	13,176	1,665,333	Panama	32,380	467,459
Greenland	736,518	16,630	United States	3,022,387	131,669,275
Guatemala	45,452	3,001,715			

SOUTH AMERICA

	Area in Square Miles	Population		Area in Square Miles	Population
Argentina	1,079,965	12,760,880	French Guiana	34,740	30,906
Bolivia	506,792	3,226,296	Paraguay	174,854	936,126
Brazil	3,275,510	43,246,931	Peru	482,258	6,500,000
British Guiana	89,480	337,039	Surinam (Dutch Guiana)	54,291	171,396
Chile	296,717	4,597,254	Uruguay	72,153	2,093,331
Colombia	448,794	8,705,540	Venezuela	352,051	3,327,753
Ecuador	275,936	2,756,552			

EUROPE

	Area in Square Miles	Population		Area in Square Miles	Population
Albania	10,629	1,003,124	Lithuania	20,390	2,349,529
Belgium	11,775	8,361,220	Netherlands	13,203	8,639,595
Bulgaria	39,825	6,077,939	Northern Ireland	5,237	1,279,753
Denmark	16,575	3,706,349	Norway	124,556	2,922,000
Eire	26,601	2,968,420	Poland	150,452	34,063,000
England	50,874	37,794,003	Portugal	34,254	7,380,906
Estonia	18,353	1,126,413	Rumania	113,884	19,535,398
Finland	147,811	3,834,662	Scotland	30,405	4,842,980
France	212,659	41,907,056	Slovakia	14,765	2,450,100
Germany	240,000	85,000,000	Soviet Union	1,821,353	170,126,000[1]
Greece	50,184	7,013,000	Spain	190,050	24,583,096
Hungary	45,000	10,350,000	Sweden	173,347	6,284,722
Iceland	39,709	117,692	Switzerland	15,944	4,200,000
Italy	119,764	43,578,000	Wales	7,466	2,158,374
Latvia	25,395	1,950,502	Yugoslavia	95,558	15,630,000

[1] Europe and Asia.

ASIA

	Area in Square Miles	Population		Area in Square Miles	Population
Afghanistan	270,000	10,000,000	Japan Proper	147,611	72,222,700
Arabia	1,000,000	10,000,000	Manchukuo	503,013	35,338,000
Bhutan	18,000	300,000	Nepal	54,000	5,600,000
British Malaya	51,172	5,173,992	Netherlands Indies	753,268	60,727,233
Burma	261,610	14,667,146	Palestine	10,429	1,418,618
Ceylon	25,332	5,312,548	Philippine Islands	114,400	16,356 000
Chinese Republic	3,998,552	428,507,548	Siam (Thailand)	200,148	14,976,000
Chosen	85,228	22,899,038	Soviet Union	6,294,901	170,126,000[1]
French Indo China	281,000	23,853,500	Syria	57,900	3,630,000
India	1,547,069	338,170,632	Taiwan	13,889	2,659,819
Iran	628,000	15,000,000	Trans Jordan	34,740	300,000
Iraq	116,000	3,560,456	Turkey[1]	298,124	16,158,018

AFRICA

	Area in Square Miles	Population		Area in Square Miles	Population
Algeria	847,500	7,234,684	Libya	684,764	850,250
Anglo Egyptian Sudan	969,600	6,186,847	Madagascar	241,094	3,797,936
Angola	487,788	3,484,300	Morocco	213,350	7,153,730
Ashanti and Gold Coast	91,843	3,700,267	Mozambique	297,654	4,895,750
Bechuanaland	275,000	265,756	Nigeria	372,599	20,476,795
Belgian Congo	902,082	10,240,499	Northern Rhodesia	290,320	1,376,325
British Somaliland	68,000	344,700	Nyasaland	37,374	1,639,329
Egypt	383,000	15,904,525	Portuguese Guinea	13,944	371,104
Eritrea	45,754	600,573	Rio de Oro	100,200	386
Ethiopia	350,000	7,600,000	Sierra Leone	27,669	1,672,000
French Equatorial Africa	959,256	3,423,015	Southern Rhodesia	150,333	1,375,540
			Southwest Africa	317,725	360,067
French Somaliland	8,492	44,240	Tanganyika	360,000	5,182,515
French West Africa	1,815,768	14,944,830	Tunisia	48,300	2,608,313
Italian Somaliland	194,000	1,021,572	Uganda	93,981	3,711,494
Kenya	224,960	3,334,191	Union of South Africa	472,550	9,589,898
Liberia	43,000	1,500,000			

AUSTRALASIA

	Area in Square Miles	Population		Area in Square Miles	Population
Australia	2,974,581	6,866,590	New Zealand	103,722	1,573,810
New Guinea	308,000	1,000,000			

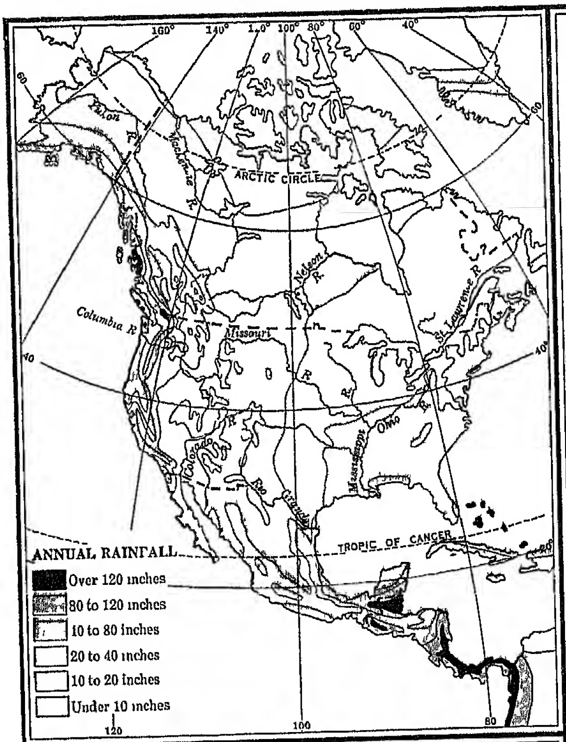
[1] Europe and Asia

UNITED STATES—STATISTICS BY STATES

	Population	Land Area in Square Miles	Percentage of Land Used for Farming	Value of Manufactures
Alabama	2,832,961	51,078	59.9	$573,763,522
Arizona	499,261	113,580	19.2	118,355,981
Arkansas	1,949,387	52,725	52.8	164,676,277
California	6,907,387	156,803	30.6	2,899,865,426
Colorado	1,123,296	103,967	45.2	237,838,370
Connecticut	1,709,242	4,899	67.4	1,261,788,693
Delaware	266,505	1,978	73.3	124,383,887
District of Columbia	663,091	61	7.1	74,107,967
Florida	1,897,414	54,262	17.2	217,044,982
Georgia	3,123,723	58,518	67.3	708,652,241
Idaho	524,873	82,808	18.7	101,324,545
Illinois	7,897,241	55,947	88.3	5,304,282,629
Indiana	3,427,796	36,205	88.9	2,497,547,946
Iowa	2,538,268	55,986	96.6	709,458,428
Kansas	1,801,028	82,113	91.7	543,807,190
Kentucky	2,845,627	40,109	80.5	504,897,342
Louisiana	2,363,880	45,177	35.9	580,839,828
Maine	847,226	31,040	21.7	348,636,096
Maryland	1,821,244	9,887	68.9	1,095,862,972
Massachusetts	4,316,721	7,907	42.7	2,620,788,793
Michigan	5,256,106	57,022	50.2	5,296,100,960
Minnesota	2,792,300	80,009	63.4	937,462,797
Mississippi	2,183,796	47,420	66.2	190,670,510
Missouri	3,784,664	69,270	79.7	1,505,383,002
Montana	559,456	146,316	50.8	176,278,814
Nebraska	1,315,834	76,653	94.8	282,502,287
Nevada	110,247	109,802	5.2	20,568,365
New Hampshire	491,524	9,024	36.6	249,631,724
New Jersey	4,160,165	7,522	39.8	3,253,246,218
New Mexico	531,818	121,511	43.9	20,598,868
New York	13,479,142	47,929	61.3	7,314,446,524
North Carolina	3,571,623	49,142	63.9	1,384,737,686
North Dakota	641,935	70,054	87.1	45,836,712
Ohio	6,907,612	41,122	87.7	5,099,816,893
Oklahoma	2,336,434	69,283	79.6	366,088,721
Oregon	1,089,684	96,350	28.4	363,142,053
Pennsylvania	9,900,180	45,045	55.3	6,032,083,005
Rhode Island	713,346	1,058	45.1	517,196,193
South Carolina	1,899,804	30,594	63.2	409,911,517
South Dakota	642,961	76,536	75.4	67,276,395
Tennessee	2,915,841	41,961	71.5	707,986,784
Texas	6,414,824	263,644	81.9	1,581,422,401
Utah	550,310	82,346	11.9	204,857,058
Vermont	359,231	9,278	69.2	111,876,051
Virginia	2,677,773	39,899	68.5	908,222,316
Washington	1,736,191	66,977	34.3	675,639,592
West Virginia	1,901,974	24,090	61.3	480,526,030
Wisconsin	3,137,587	54,715	66.3	1,772,310,417
Wyoming	250,742	97,506	45.1	49,128,729

ATLAS SECTION

PLATE I


ANNUAL RAINFALL
Over 120 inches
80 to 120 inches
40 to 80 inches
20 to 40 inches
10 to 20 inches
Under 10 inches
ARCTIC CIRCLE
TROPIC OF CANCER
Yukon R.
Mackenzie R.
Nelson R.
St. Lawrence R.
Columbia R.
Missouri
Ohio R.
Mississippi
Colorado
Rio Grande


ARCTIC CIRCLE

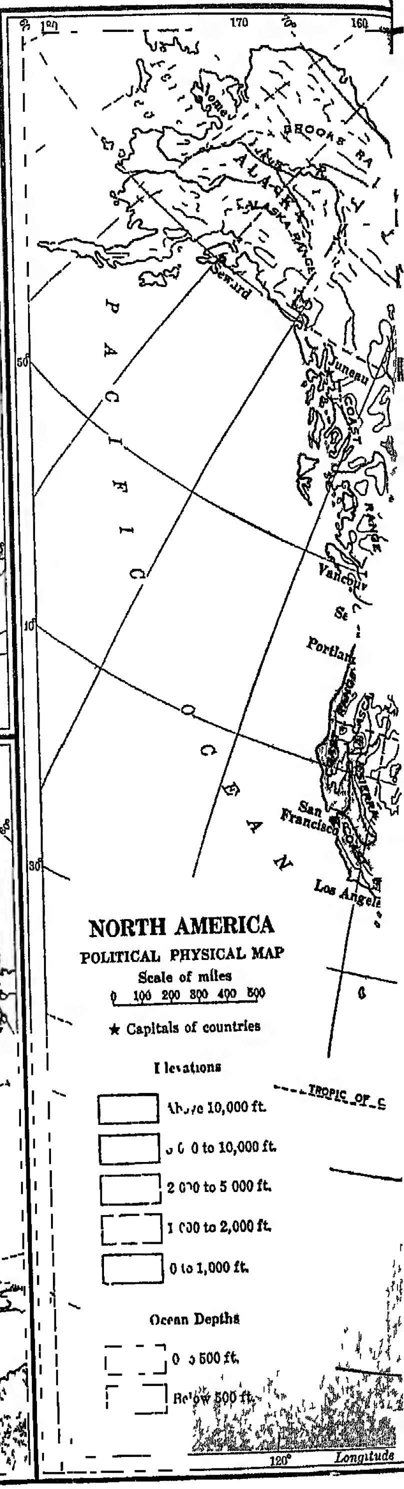
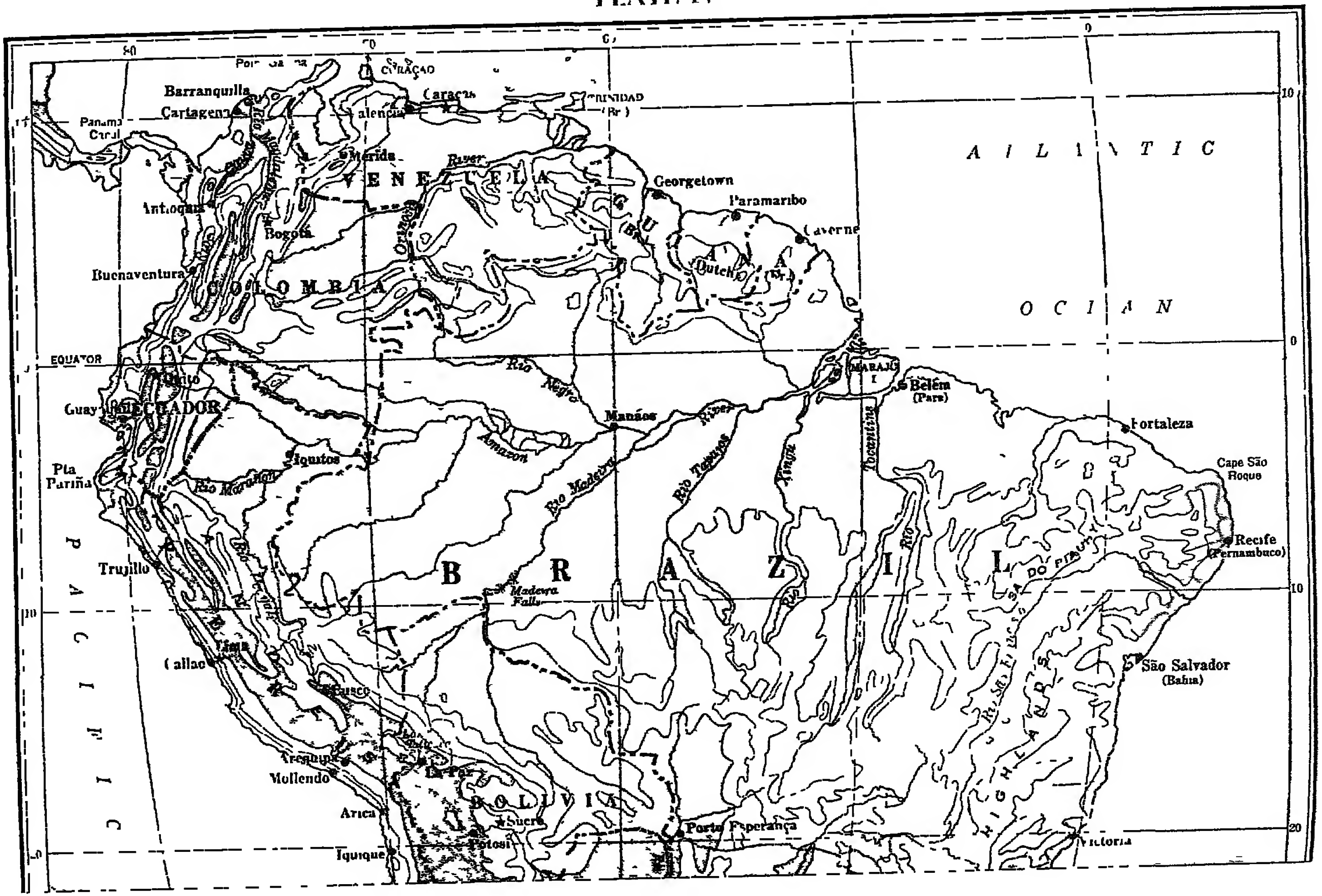

NORTH AMERICA
POLITICAL PHYSICAL MAP
Scale of miles
0 100 200 300 400 500
★ Capitals of countries
Ocean Depths
PACIFIC OCEAN
BROOKS
ALASKA RANGE
Nome
Seward
Juneau
COAST
Portland
San Francisco
Los Angeles
Longitude

PLATE III

95°
90°
85°
80°
75°
70°
65°
50°
45°
James Bay
St. Lawrence R.
Saguenay R.
HEIGHT OF LAND
Ottawa
Lake Superior
Lake Huron
Lake Michigan
Lake Ontario
Lake Erie
Long Island Sound
C. Cod
ATLANTIC OCEAN
C. Hatteras
OZARK PLATEAU
Ouachita Mts
Galveston Bay
Gulf of Mexico
Tampa Bay

PLATE IV


ATLANTIC OCEAN
PACIFIC
Barranquilla
Cartagena
Panama Canal
CURAÇAO
Caracas
TRINIDAD (Br.)
Merida
VENEZUELA
Georgetown
Paramaribo
GUIANA
Antioquia
Bogotá
Buenaventura
COLOMBIA
Orinoco
EQUATOR
Quito
ECUADOR
Rio Negro
Manáos
Belém (Para)
MARAJO I.
Fortaleza
Cape São Roque
Recife (Pernambuco)
Amazon
Iquitos
Rio Marañon
Rio Madeira
Rio Tapajos
Xingu
Tocantins
Pta Pariña
Trujillo
BRAZIL
Madeira Falls
Callao
Lima
Cusco
São Salvador (Bahia)
HIGHLANDS
Arequipa
Mollendo
La Paz
BOLIVIA
Sucre
Potosi
Arica
Iquique
Porto Esperança
Victoria

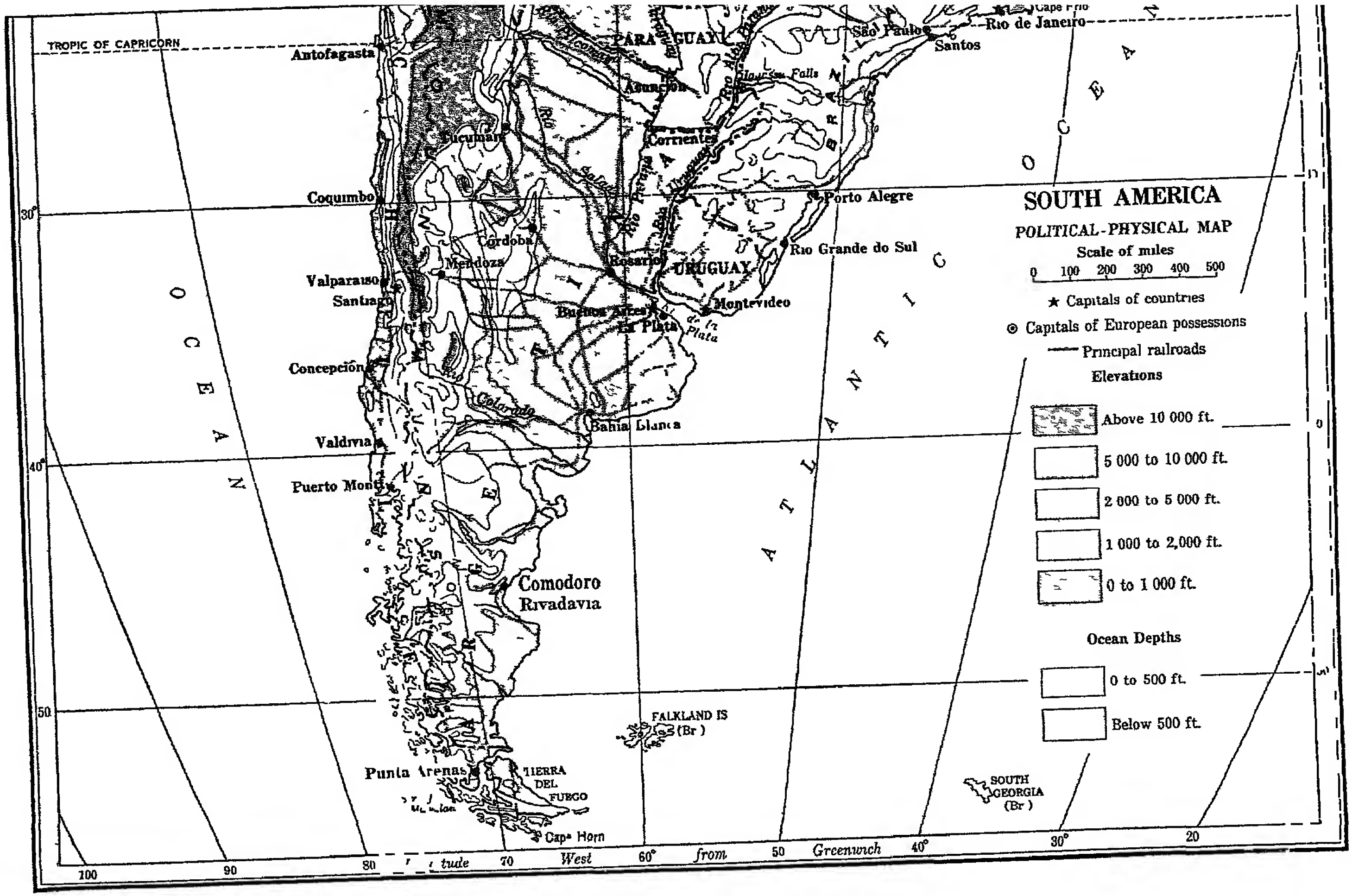
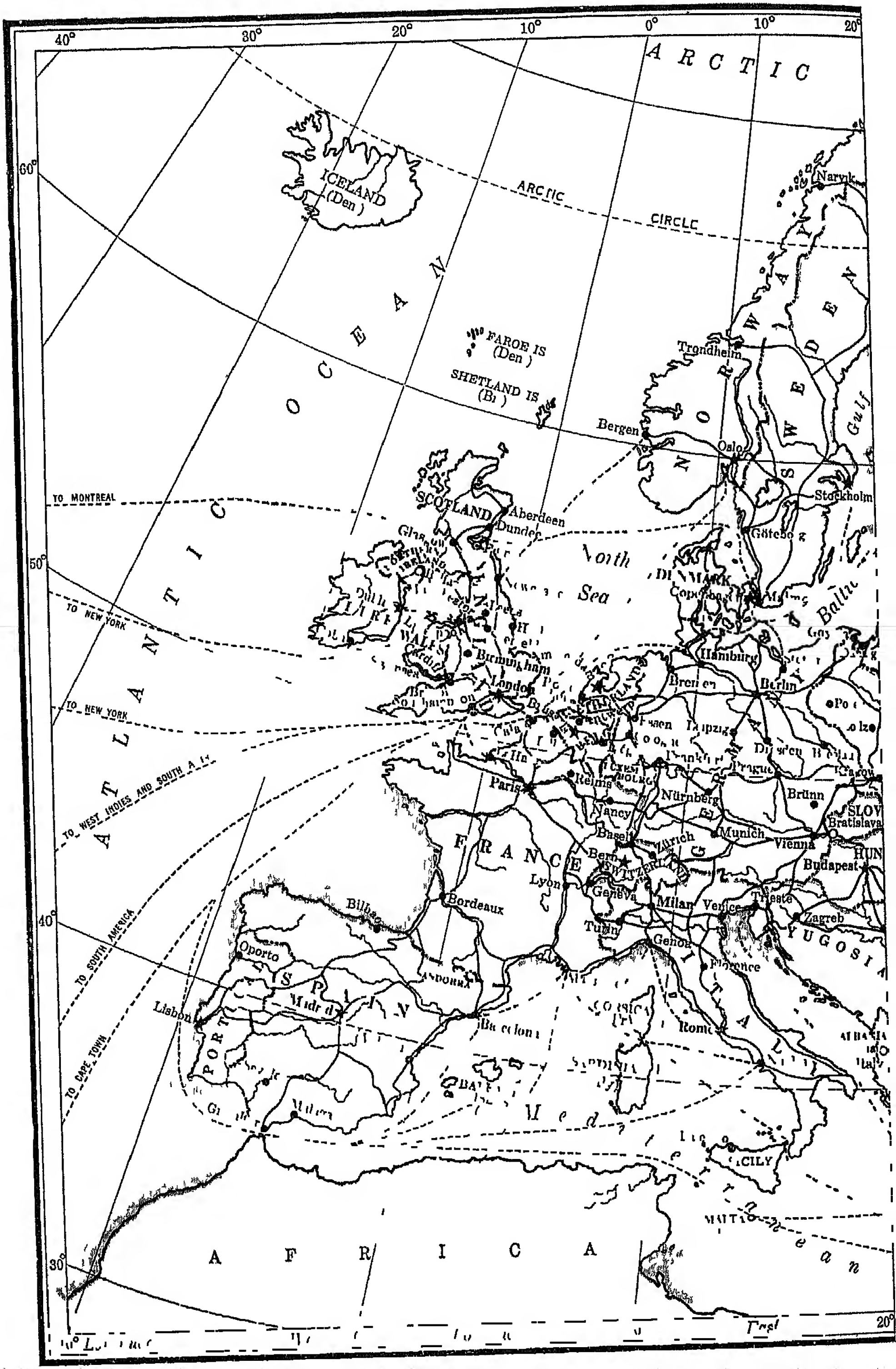
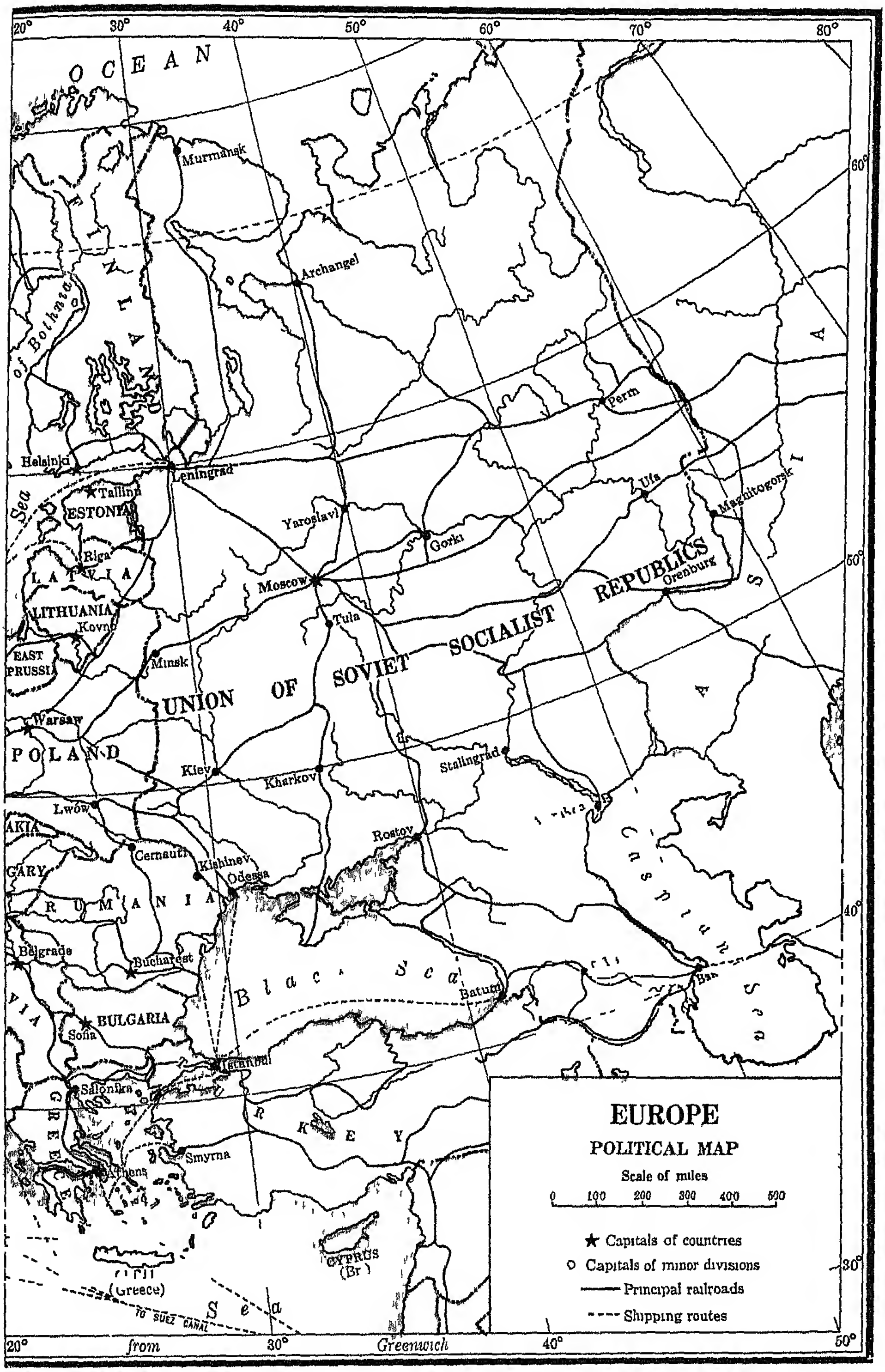

SOUTH AMERICA
POLITICAL-PHYSICAL MAP
Scale of miles
0 100 200 300 400 500
★ Capitals of countries
⊙ Capitals of European possessions
Principal railroads
Elevations
Above 10 000 ft.
5 000 to 10 000 ft.
2 000 to 5 000 ft.
1 000 to 2,000 ft.
0 to 1 000 ft.
Ocean Depths
0 to 500 ft.
Below 500 ft.
TROPIC OF CAPRICORN
Antofagasta
Coquimbo
Valparaiso
Santiago
Concepción
Valdivia
Puerto Montt
Punta Arenas
TIERRA DEL FUEGO
Cape Horn
Comodoro Rivadavia
Bahia Blanca
Buenos Aires
La Plata
Rosario
Córdoba
Mendoza
Tucumán
Corrientes
Asunción
PARAGUAY
URUGUAY
Montevideo
Rio Grande do Sul
Porto Alegre
São Paulo
Santos
Rio de Janeiro
Colorado
FALKLAND IS (Br.)
SOUTH GEORGIA (Br.)
OCEAN
ATLANTIC
OCEAN
West from Greenwich
100 90 80 70 60° 50 40° 30° 20
30° 40° 50

PLATE V



ARCTIC
ARCTIC CIRCLE
ICELAND (Den.)
OCEAN
ATLANTIC
FAROE IS (Den.)
SHETLAND IS (Br.)
NORWAY
SWEDEN
Narvik
Trondheim
Bergen
Oslo
Stockholm
Göteborg
SCOTLAND
Aberdeen
Dundee
North Sea
DENMARK
Copenhagen
Baltic
Hamburg
Bremen
Berlin
Birmingham
London
WALES
TO MONTREAL
TO NEW YORK
TO NEW YORK
TO WEST INDIES AND SOUTH AMERICA
TO SOUTH AMERICA
TO CAPE TOWN
Paris
Reims
Nancy
Nürnberg
Munich
Vienna
Bratislava
Budapest
Brünn
Basel
Zürich
Bern
SWITZERLAND
Geneva
Lyon
FRANCE
Bordeaux
Bilbao
Oporto
Lisbon
SPAIN
Turin
Milan
Venice
Trieste
Zagreb
Genoa
Florence
Rome
YUGOSLAVIA
SICILY
AFRICA
40°
30°
20°
10°
0°
10°
20°
60°
50°
40°
30°

PLATE V



OCEAN
Murmansk
Archangel
FINLAND
Gulf of Bothnia
Helsinki
Leningrad
Tallinn
ESTONIA
Riga
LATVIA
LITHUANIA
Kovno
EAST PRUSSIA
Minsk
Warsaw
POLAND
Lwów
Yaroslavl
Gorki
Moscow
Tula
Perm
Ufa
Magnitogorsk
Orenburg
UNION OF SOVIET SOCIALIST REPUBLICS
ASIA
Kiev
Kharkov
Stalingrad
Rostov
Cernauti
Kishinev
Odessa
RUMANIA
Belgrade
Bucharest
BULGARIA
Sofia
Black Sea
Batum
Caspian Sea
Baku
Istanbul
Salonika
GREECE
Athens
Smyrna
TURKEY
CYPRUS (Br.)
(Greece)
TO SUEZ CANAL
Sea
20°
30°
40°
50°
60°
70°
80°
from Greenwich
EUROPE
POLITICAL MAP
Scale of miles
0 100 200 300 400 500
★ Capitals of countries
○ Capitals of minor divisions
Principal railroads
Shipping routes

PLATE VI

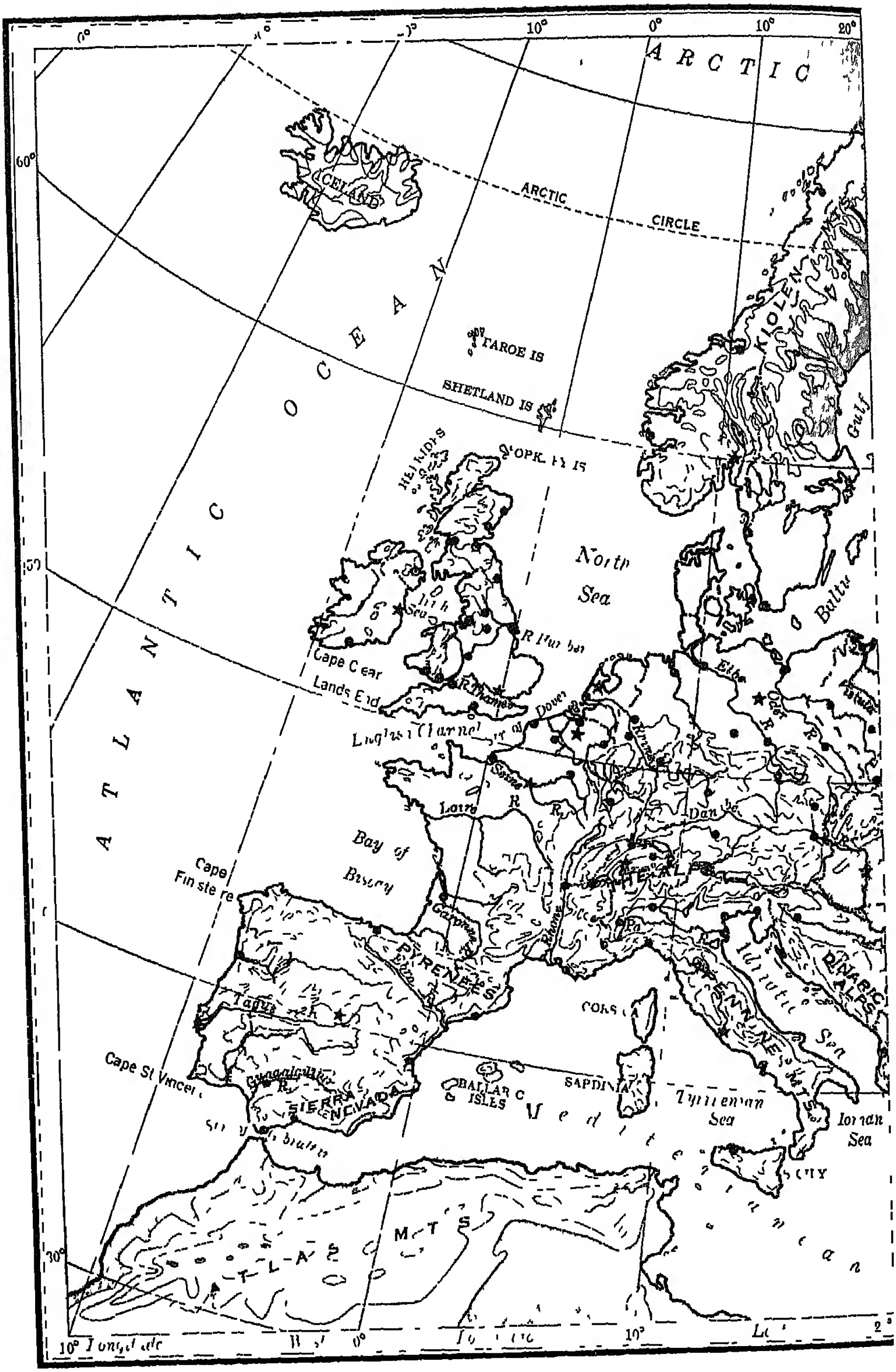
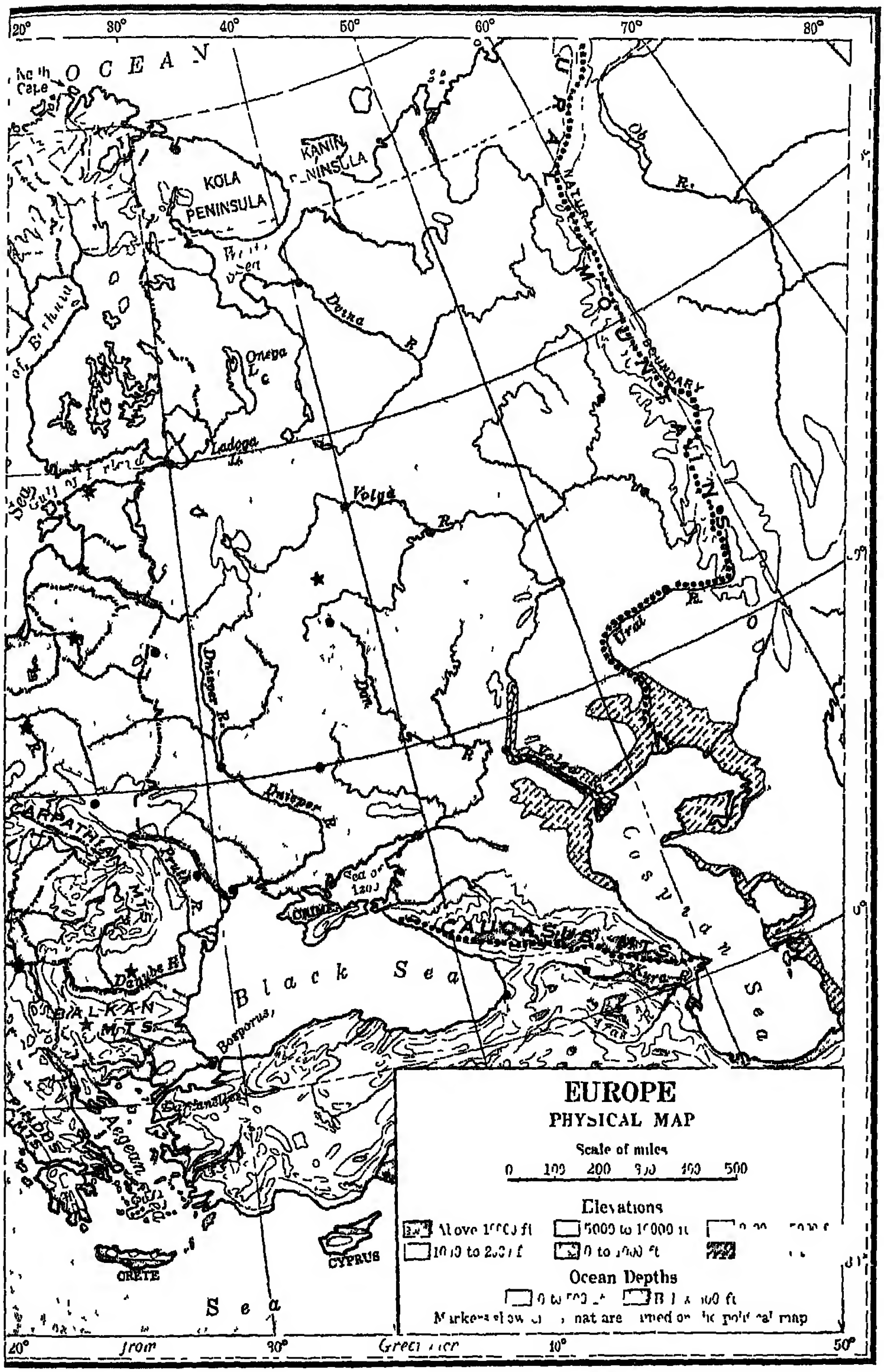

ARCTIC
ARCTIC
CIRCLE
ICELAND
ATLANTIC OCEAN
FAROE IS
SHETLAND IS
KIOLEN
Gulf
North
Sea
Baltic
R Humber
Cape Clear
Lands End
R Thames
Dover
Elbe
Oder
Seine
Loire
Bay of
Biscay
Cape
Finisterre
Garonne
PYRENEES
Ebro
Tagus
Rhone
Po
ALPS
APENNINES
DINARIC
ALPS
Adriatic
Sea
CORS
SARDINIA
BALEARIC
ISLES
Tyrrhenian
Sea
Ionian
Sea
Cape St Vincent
SIERRA NEVADA
Mediterranean
ATLAS MTS
60°
50°
30°
0°
10°
20°

PLATE VI



20°
30°
40°
50°
60°
70°
80°
O C E A N
KOLA
PENINSULA
KANIN
PENINSULA
NATURAL
BOUNDARY
Ob
R.
Dvina
R.
Onega
L.
Ladoga
L.
Volga
R.
Ural
R.
Dnieper R.
Don
R.
Dnieper
R.
CARPATHIAN
MTS.
Danube R.
BALKAN
MTS.
Black Sea
Bosporus
CRIMEA
Sea of
Azov
CAUCASUS MTS.
Kura R.
Caspian Sea
Aegean
CRETE
CYPRUS
S e a
EUROPE
PHYSICAL MAP
Scale of miles
0 100 200 400 500
Elevations
Ocean Depths
20°
30°
40°
50°

PLATE VII

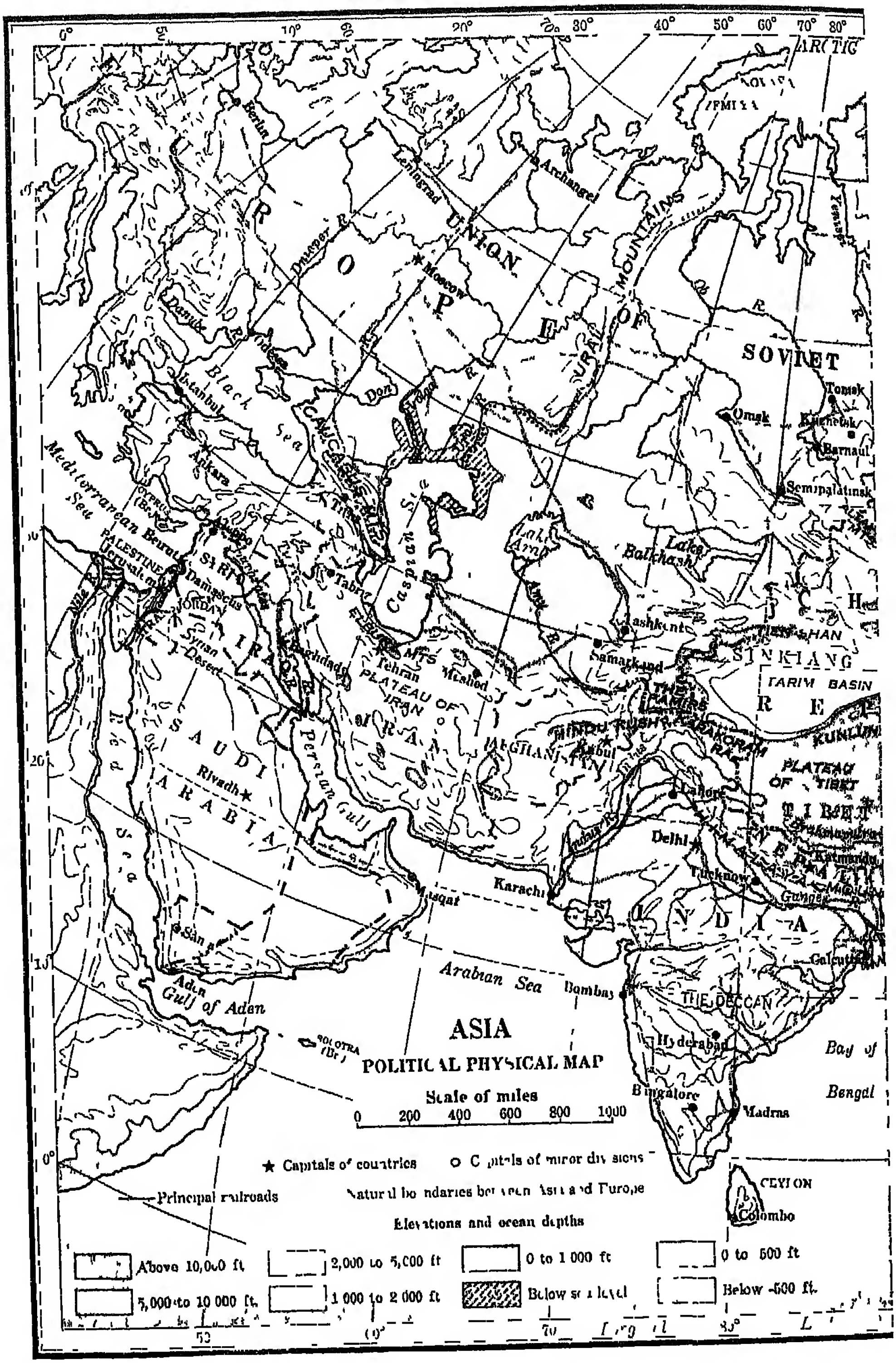
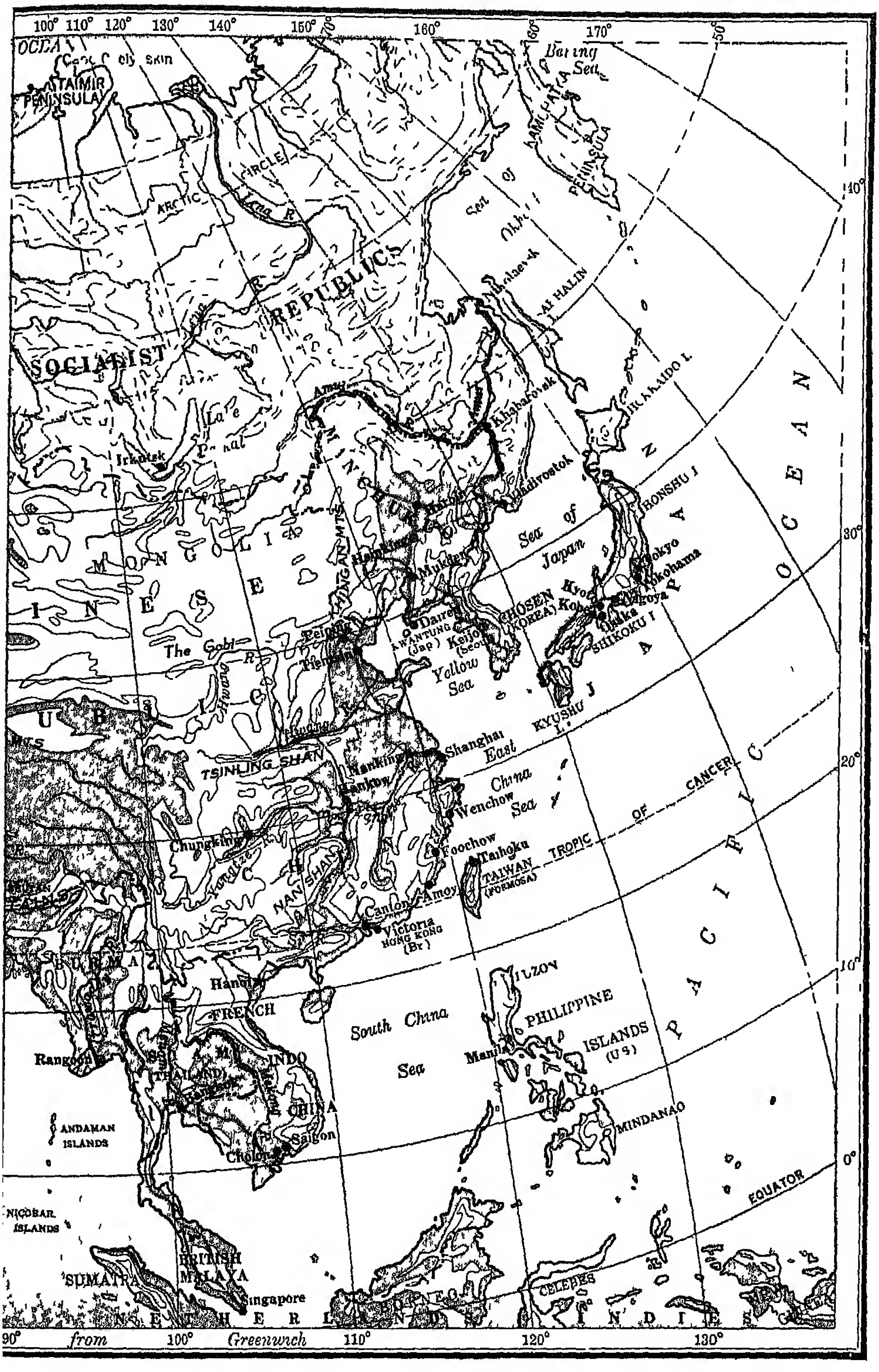
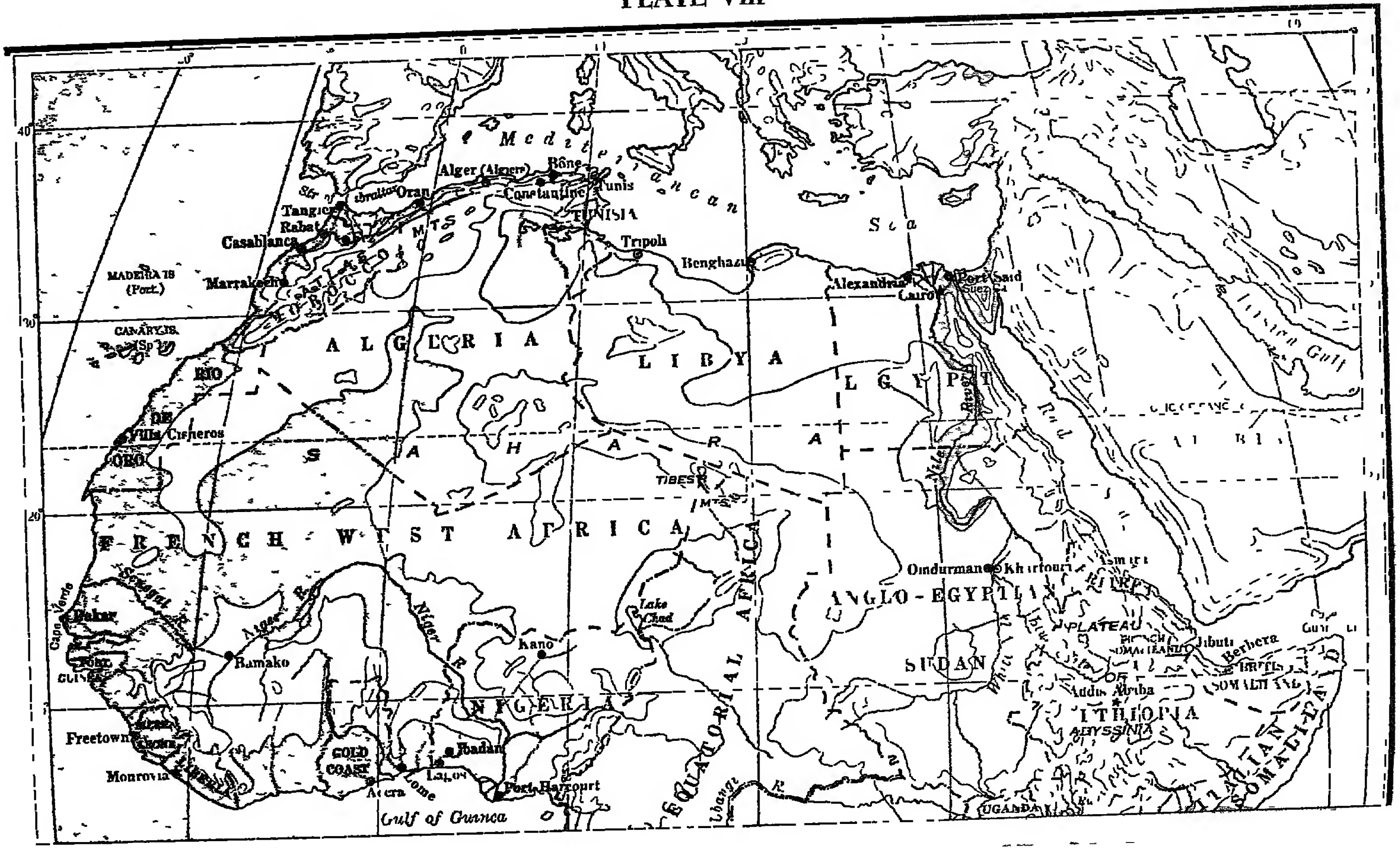

ASIA
POLITICAL PHYSICAL MAP
Scale of miles
0 200 400 600 800 1000
Capitals of countries
Principal railroads
Elevations and ocean depths
Above 10,000 ft
5,000 to 10 000 ft.
2,000 to 5,000 ft
1 000 to 2 000 ft
0 to 1 000 ft
Below sea level
0 to 600 ft
Below -600 ft.
Berlin
Leningrad
Archangel
Moscow
UNION
OF
SOVIET
MOUNTAINS
Dnieper R.
Danube
Odessa
Black Sea
Don
Istanbul
Ankara
Mediterranean Sea
CYPRUS
Beirut
PALESTINE
Jerusalem
Damascus
JORDAN
Syrian Desert
SYRIA
IRAQ
Baghdad
Tabriz
Caspian Sea
Tehran
Meshed
PLATEAU OF IRAN
IRAN
AFGHANISTAN
Kabul
HINDU KUSH
Samarkand
Tashkent
Lake Balkhash
Omsk
Tomsk
Barnaul
Semipalatinsk
SINKIANG
TARIM BASIN
KUNLUN
PLATEAU OF TIBET
TIBET
Lahore
Delhi
Lucknow
Ganges
Calcutta
INDIA
Indus R.
Karachi
Muscat
Persian Gulf
SAUDI
ARABIA
Riyadh
Red Sea
Aden
Gulf of Aden
Arabian Sea
Bombay
THE DECCAN
Hyderabad
Bangalore
Madras
Bay of
Bengal
CEYLON
Colombo
ARCTIC

PLATE VII



TAIMIR PENINSULA
ARCTIC CIRCLE
Lena R
SOCIALIST
REPUBLICS
Bering Sea
KAMCHATKA PENINSULA
Sea of Okhotsk
SAKHALIN
HOKKAIDO I
Amur
Khabarovsk
Irkutsk
Lake Baikal
Vladivostok
MONGOLIA
CHINESE
The Gobi
Hwang R
KHINGAN MTS
Hsinking
Mukden
Dairen
KWANTUNG (Jap)
Keijo (Seoul)
CHOSEN (KOREA)
Peiping
Tientsin
Sea of Japan
Yellow Sea
HONSHU I
Tokyo
Yokohama
Nagoya
Kobe
Osaka
SHIKOKU I
KYUSHU I
TSINLING SHAN
Nanking
Shanghai
Hankow
East China Sea
Wenchow
Chungking
Yangtze
NAN SHAN
Foochow
Taihoku
TAIWAN (FORMOSA)
Amoy
Canton
Victoria
HONG KONG (Br)
TROPIC OF CANCER
PACIFIC OCEAN
Hanoi
FRENCH INDO CHINA
BURMA
Rangoon
THAILAND
Bangkok
Saigon
Cholon
South China Sea
LUZON
PHILIPPINE ISLANDS (U S)
Manila
MINDANAO
ANDAMAN ISLANDS
NICOBAR ISLANDS
EQUATOR
SUMATRA
BRITISH MALAYA
Singapore
CELEBES
NETHERLANDS INDIES
100° 110° 120° 130° 140° 150° 160° 170°
40° 30° 20° 10° 0°
90° from 100° Greenwich 110° 120° 130°

PLATE VIII



Mediterranean
Sea
Red Sea
Alexandria
Cairo
Port Said
Suez
EGYPT
Benghazi
Tripoli
Tunis
TUNISIA
Bône
Constantine
Alger (Algiers)
Oran
Tangier
Rabat
Casablanca
Marrakech
ALGERIA
LIBYA
SAHARA
FRENCH WEST AFRICA
ANGLO-EGYPTIAN SUDAN
Omdurman
Khartoum
ETHIOPIA
ABYSSINIA
Addis Ababa
Jibuti
Berbera
SOMALILAND
UGANDA
EQUATORIAL AFRICA
Lake Chad
TIBESTI
Kano
NIGERIA
Niger R.
Ibadan
Lagos
Port Harcourt
Gulf of Guinea
Lome
Accra
GOLD COAST
Bamako
Monrovia
Freetown
Cape Verde
Dakar
Senegal R.
Villa Cisneros
RIO DE ORO
MADEIRA IS (Port.)
CANARY IS (Sp.)

ATLANTIC
OCEAN
AFRICA
POLITICAL-PHYSICAL MAP
Scale of miles
0 100 200 300 400 500
★ Capitals of countries
Capitals of European posse
Principal railroads
Elevations
Above 10 000 f
5,000 to 10,000
2 000 to 5,000
1,000 to 2,000
0 to 1,000 ft.
Ocean Depths
0 to 500 ft.
Below 500 ft.
Longitude
Libreville
FRENCH
Brazzaville
Leopoldville
Stanleyville
BEL
CONGO
TANGANYIKA
Mombasa
Zanzibar
Mozambique
ANGOLA
NORTHERN
RHODESIA
Lusaka
SOUTHERN
RHODESIA
Beira
SOUTHWEST
AFRICA
Swakopmund
Windhoek
BECHUANALAND
Lourenço Marques
Kimberley
Durban
UNION OF SOUTH
Cape Town
Port Elizabeth
INDIAN
OCEAN

PLATE IX


AUSTRALASIA
POLITICAL PHYSICAL MAP
Scale of miles
0 100 200 300 400 500
Capitals of dominions
Capitals of Australian states
Principal railroads
Elevations
Above 10,000 ft.
5,000 to 10,000 ft.
2 000 to 5 000 ft
1,000 to 2,000 ft
0 to 1 000 ft.
Ocean Depths
0 to 500 ft.
Below 500 ft.
BORNEO (Dutch)
CELEBES
SUMATRA
NETHERLANDS INDIES
Banjermasin
Strait of Makassar
Makassar
Java Sea
Banda Sea
Batavia
MADURA I
BALI I
LOMBOK I
SUMBAWA
SUMBA I
FLORES I
TIMOR I
BURU I.
CERAM
MOLUCCAS OR SPICE IS
ARU IS
TIMOR LAUT IS
SUNDA ISLANDS
Arafura
Timor Sea
Darwin
Katherine
Birdum
Wyndham
INDIAN OCEAN
NORTHERN TERRITORY
Port Hedland
Great Sandy Desert
MACDONNELL RANGE
Alice Springs
TROPIC OF CAPRICORN
WESTERN AUSTRALIA
Wiluna
Laverton
Oodnadatta
Geraldton
Great Victoria Desert
Kalgoorlie
Coolgardie
Perth
Fremantle
Great Australian Bight
Cape Leeuwin
Albany
Longitude
90°
100°
110°
120°
130°
10°
20°
30°
40°

PLATE IX

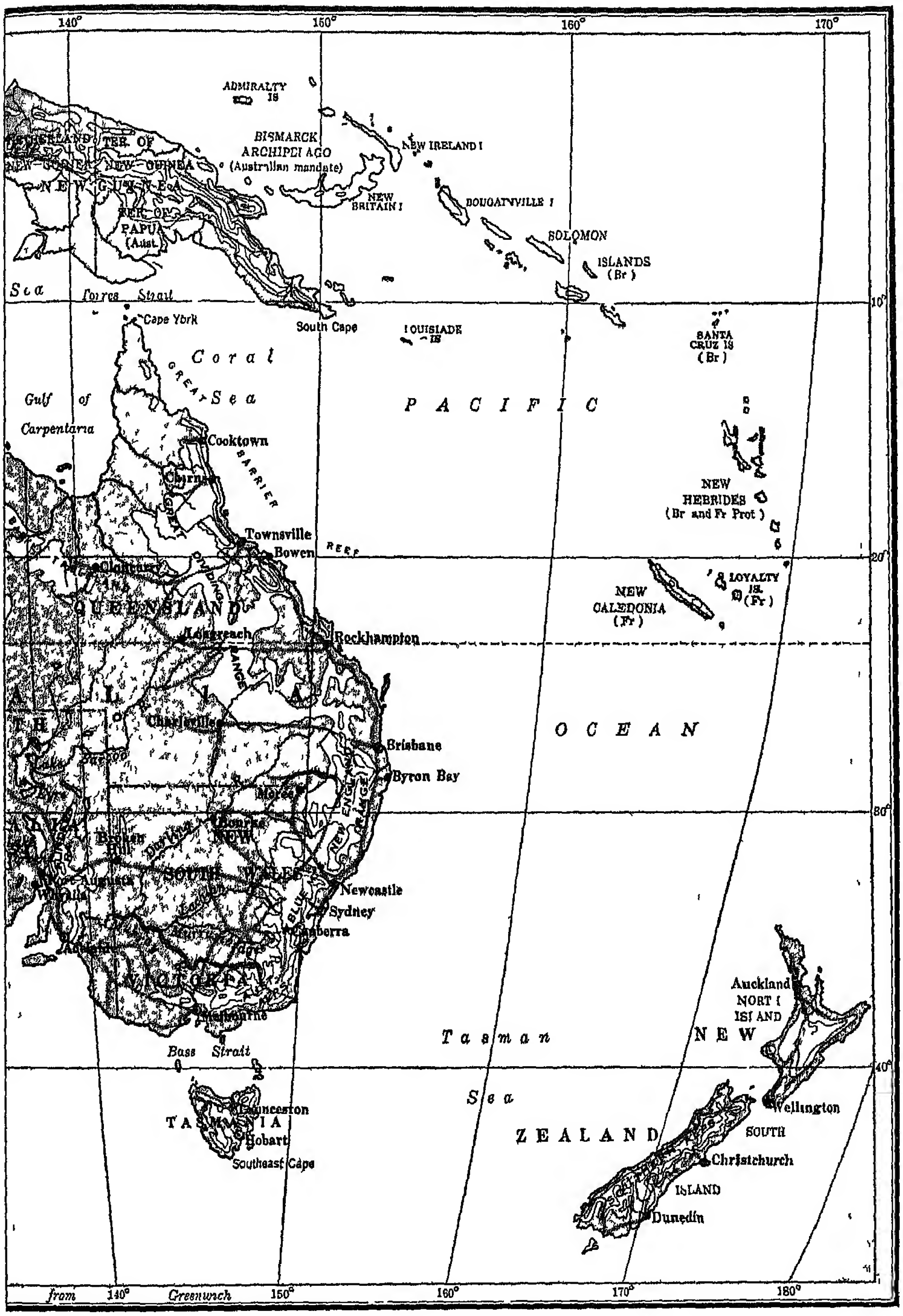

ADMIRALTY IS
BISMARCK ARCHIPELAGO (Australian mandate)
NEW IRELAND I
NEW BRITAIN I
BOUGAINVILLE I
SOLOMON ISLANDS (Br)
TER. OF NEW GUINEA
NEW GUINEA
TER. OF PAPUA (Aust.)
Torres Strait
Cape York
South Cape
LOUISIADE IS
SANTA CRUZ IS (Br)
Coral Sea
GREAT BARRIER REEF
Gulf of Carpentaria
PACIFIC
Cooktown
Townsville
Bowen
NEW HEBRIDES (Br and Fr Prot)
NEW CALEDONIA (Fr)
LOYALTY IS. (Fr)
QUEENSLAND
Rockhampton
Charleville
OCEAN
Brisbane
Byron Bay
Newcastle
Sydney
Canberra
Melbourne
Bass Strait
Tasman Sea
Auckland
NORTH ISLAND
NEW ZEALAND
Wellington
SOUTH ISLAND
Christchurch
Dunedin
TASMANIA
Launceston
Hobart
Southeast Cape
from 140° Greenwich 150° 160° 170° 180°

PLATE X

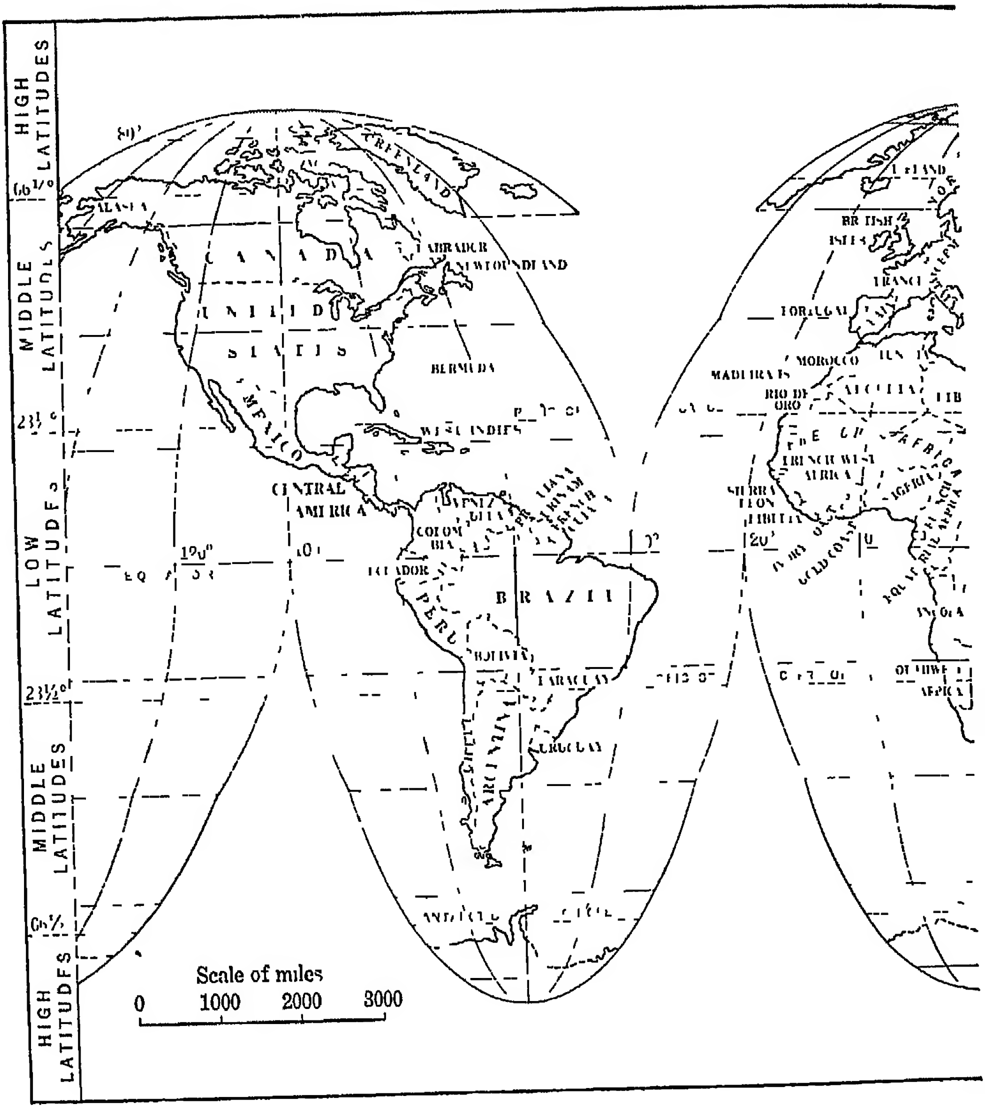
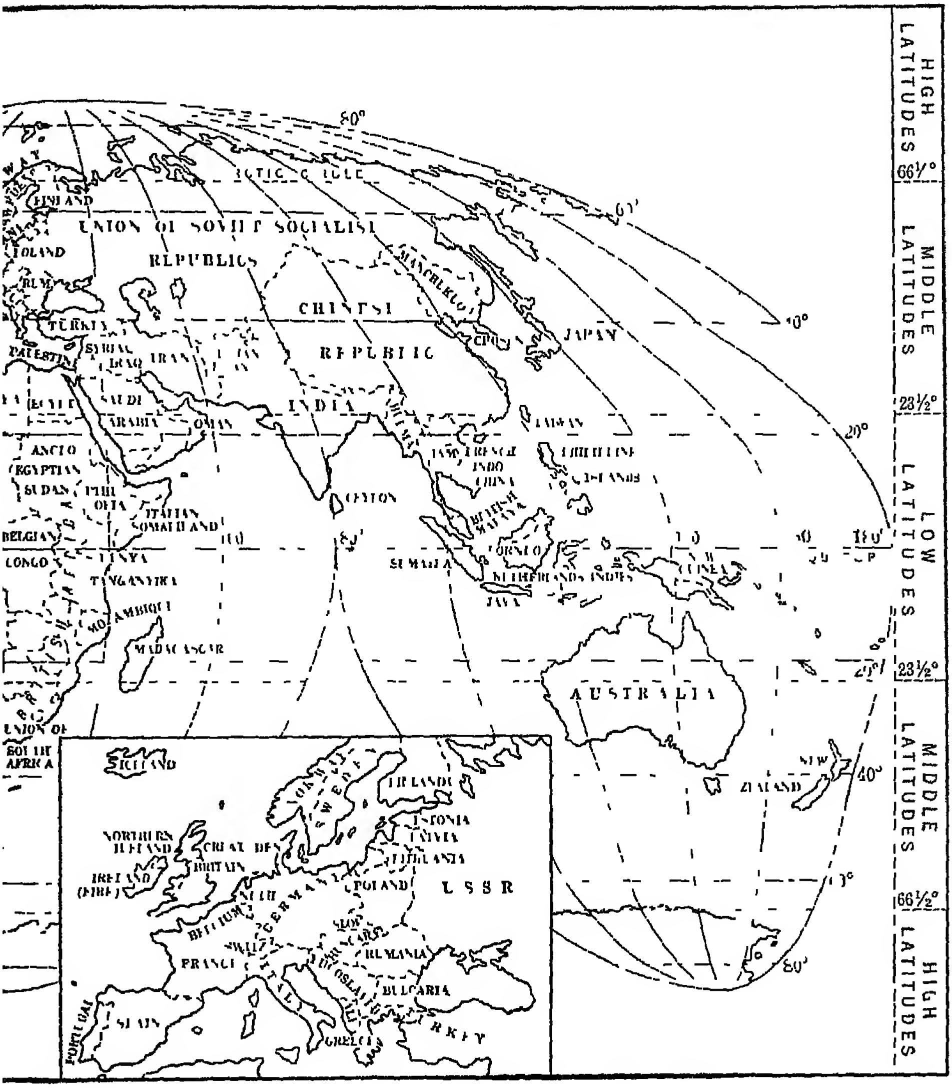

HIGH LATITUDES
MIDDLE LATITUDES
LOW LATITUDES
MIDDLE LATITUDES
HIGH LATITUDES
CANADA
UNITED STATES
MEXICO
CENTRAL AMERICA
WEST INDIES
BERMUDA
NEWFOUNDLAND
BRAZIL
PERU
ECUADOR
URUGUAY
ARGENTINA
BRITISH ISLES
FRANCE
PORTUGAL
MOROCCO
MADEIRA IS
RIO DE ORO
FRENCH WEST AFRICA
SIERRA LEON
LIBERIA
ANGOLA
Scale of miles
0
1000
2000
3000

PLATE X



HIGH LATITUDES
66½°
MIDDLE LATITUDES
23½°
LOW LATITUDES
23½°
MIDDLE LATITUDES
66½°
HIGH LATITUDES
REPUBLICS
REPUBLIC
JAPAN
TURKEY
PALESTINE
IRAQ
IRAN
INDIA
OMAN
CEYLON
SUDAN
ITALIAN SOMALILAND
BELGIAN
CONGO
MADAGASCAR
AUSTRALIA
JAVA
ICELAND
NORTHERN IRELAND
IRELAND (EIRE)
BRITAIN
POLAND
U S S R
BELGIUM
FRANCE
RUMANIA
BULGARIA
PORTUGAL

INDEX

KEY ā as in āle, ă as in ăm, ȧ as in senȧte, â as in câre, ȧ as in ask, ä as in ärm, ă as in ăccount, a as in sofa, ē as in ēve, ĕ as in ĕnd, ė as in ėvent, ẽ as in makẽr, ĕ as in recĕnt, ī as in īce, ĭ as in ĭll, ĭ as in charĭty, ō as in ōld, ŏ as in ŏdd, ȯ as in ȯbey, ô as in ôrb, ŏ as in sŏft, ŏ as in cŏnnect, ū as in ūse, ŭ as in ŭp, ū as in ūnite, û as in ûrn, ŭ as in circŭs, ü as in menu, ōō as in fōōd, ŏŏ as in fŏŏt, oi as in oil, ou as in out, ñ as in canyon, ŋ as in iŋk, N as in boN, K as ch in German ich, th as in then, tu as in nature, ' as in evil (ē'v'l)

NOTE Roman numerals refer to plates in the Atlas Section of the book Locations are correct to the nearest degree, minutes and seconds being omitted

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